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JOURNAL

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ROYAL HORTICULTURAL SOCIETY.

VOL. XLIII. 1917.

PART I.

THE HERBACEOUS BORDER.

By JOHN DICKSON, F.R.H.S.

[Read February 27, 1917; Mr. E. A. BOWLES, M.A., in the Chair.]

WITHIN the past twenty years, the number and quality of new introductions among herbaceous plants, the wonderful extension of their cultivation, the improved methods of exhibiting at shows, and the more tasteful and appropriate arrangements in gardens, have all reached a greater development than in any previous period of similar length.

With regard to new introductions from distant lands, we have had many which are valuable acquisitions, not only on account of their intrinsic charms, but because of their great possibilities and usefulness for hybridizing and cross-fertilizing purposes. China has proved a fertile source of treasures of which you have heard, read, and seen sufficient to render it superfluous for me to deal at length with them. In not a few cases the plant-breeder is provided with ample scope for the exercise of his skill in raising and selecting forms that in some feature or other shall be more suitable for British culture than the original types.

A good many of the Primulas, Androsaces, and Meconopses have peculiarities which have thus far prevented them making themselves quite at home, so to speak, in this country, but their extreme beauty warrants a deal of effort to try to improve them in the matter of hardiness, and it is my belief that this can be as well accomplished by

persevering selection as can improvements in size, colour, and other characteristics. We have already witnessed remarkable improvement in that elegant and floriferous little plant *Primula malacoides*, and although it may not be that every recent introduction would prove so accommodating as this little gem, I am convinced patient labour will be eventually rewarded in many directions.

In cross-breeding, too, we have already reaped the firstfruits of the use of some of the Chinese plants, and we have abundant material for further developments.

It is strange that, whilst some families of plants have been so vastly improved as to bear little resemblance to the old species and varieties that formed the foundation upon which the modern races have been built, other quite useful subjects have shown little or no advancement for many years; and it certainly seems to me that we might well relax our continuous efforts to add to the numbers of named varieties of such things as Delphiniums, Phloxes, Gaillardias, and Violas, in order to devote some attention to other subjects whose possibilities for development and improvement appear to have been overlooked. Is there, for instance, no possibility of producing new and improved varieties of so useful a plant as the Statice? We know the value of *Statice incana, tatarica,* and *latifolia,* which in a dried state have, until the present time of war, been an article of great commercial value to Germany, whence we annually imported large quantities. The Statices are familiar enough in herbaceous borders, and are not to be despised as garden plants apart from their uses for winter decoration; but could not our plant-breeders produce new varieties of even greater merits? The colours of most of them are of quiet and sombre shades, but the production of larger-flowered varieties with bright, distinct colours would enhance their value and endow them with infinitely greater interest. We have seen what has been done with Heucheras, mossy Saxifrages, and other simple flowers that have been taken in hand, but who knows the possibilities lying latent in Sempervivums, Sedums, Armerias, and numerous others that we seem to have been quite content to plant, but not to endeavour to improve?

In the matter of planning and arranging herbaceous borders, vast improvements have been made, the old straight lines of plants, graduated from the tall back row to the dwarfest-growing front row, have rightly given place to bold grouping in a freer and more pleasing style, and the studied arrangement of colour has resulted in the creation of borders of character and refinement. We still, however, too often come across arrangements of hardy plants that have the defect of periodical breaks in their effectiveness, and we are too familiar with the apologetic remarks with which an owner is wont to usher us into his garden, saying that had we only been a fortnight earlier we should have been delighted with the Pæonies or the Irises, now, alas, shorn of their splendour; or that, unfortunately, we are a bit too early to see the border at its best, since its main features are its Delphiniums,

Phloxes, or Pentstemons. To keep an ordinary border of herbaceous plants uniformly attractive from spring to autumn is extremely difficult, if not well-nigh impossible, and it is this fact which has caused the more formal summer-bedding of half-hardy plants to be adhered to in many private gardens and most public parks. Enthusiasts who have ample space and means can arrange a series of what are termed seasonal borders, devoting each to plants that bloom at a certain time—and there are several instances in the country where very attractive spring, summer, and autumn borders each in turn delight the eyes of owner and visitors alike. But in a small garden this is impossible, and as it is here the defects of the ordinary borders are most noticeable and vexatious, it becomes necessary and wise to call in the aid of other plants, and to adopt carefully thought-out schemes of arrangement. A judicious use of flowering shrubs, interspersed or grouped among the herbaceous plants, is of great value. The hardy Ericas, for instance, may be so arranged as to provide pleasing dashes of colour at seasons of the year when the colour is most wanted. The brooms, such as *Cytisus praecox*, give us some early blossom, and the berried Pernettyas are useful when other things are past. The handsome fruits of *Arbutus Unedo* will brighten a spot that has lost all other interest, and in the depth of winter the Wych Hazels will provide quaint flowers and delicious fragrance. To speak exhaustively of the charms and possibilities of the entire range of early-flowering shrubs would be too great a task even for the whole afternoon, but it must suffice to throw out simply the suggestion that those who take upon themselves the task of arranging and planting a garden should endeavour rather to mingle shrubs with herbaceous plants than to confine themselves entirely to the latter.

Again, I would strongly advocate the liberal use of hardy annuals, especially for the purpose of filling in vacant spaces where early-flowering plants have passed their effective stage, or late ones are still in the process of development. Of course it is necessary, when planting the permanent features, to work to a plan that provides room in convenient positions for these fill-gaps, and it is also advisable to make both autumn and spring sowings of the annuals in order to obtain both early and late flowers to meet all requirements. The sowing is best made in the reserve garden, so that the plants can be put out as required, and for this purpose I can strongly recommend the use of the paper or cardboard seed-raisers, which enable the plants to be transplanted without disturbance of the roots. Another method of planning a border capable of yielding good results is to carpet the ground with close-growing plants such as Aubrietias, Arabis, Forget-me-nots, *Saponaria ocymoides*, Violas, &c., and to intersperse somewhat thinly taller erect-growing subjects that will grow through without smothering the carpeting plants, and flower at various seasons. Such things as Anthericums, Camassias, *Liatris spicata*, *Michauxia campanuloides*, *Galtonia candicans*, Gladioli, and Lilies, are but a few suitable subjects for such arrangements, and whether in borders or in

isolated beds on grass, delightful effects can, with a little intelligent forethought, be thus secured.

For spring bedding there is no lack of hardy biennial and perennial plants that can be depended upon to make a good show. Polyanthus, double Daisies, Wallflowers, Aubrietias, Sedums, Hepaticas, and Anemones, are all too familiar to require any recommendation, but later in the season it is not so simple a matter to keep a bed neat and uniformly gay. Antirrhinums are of inestimable worth for this purpose, and are deservedly advancing in popularity year by year. There are plenty of good things that will produce a blaze of colour for a month or so; but for an isolated bed in a conspicuous position this is scarcely sufficient, except in the case of an establishment where the family are in residence for a short time only, and the bed can be timed to be in its prime just at the correct period. I have seen a bed planted with the compact little plant named *Chaenostoma hispida* which has been densely spangled with its small white starry flowers from May until October, and with a few dot plants of dark foliage such as the brilliant-flowered *Lobelia cardinalis* a striking effect is obtainable. *Gilia coronopifolia* is another suitable companion for the *Chaenostoma,* or even *Chelone barbata* or its variety *Torreyi. Nepeta Mussini* is another good bedding subject, and either a deep yellow or dark red flower of taller growth makes a good combination. Pentstemons are, of course, well known as good bedding plants, and I have recollections of a gorgeous show of colour produced by a large bed of a good strain of hybrid *Mimulus,* which also does remarkably well in the moist soil alongside a stream or pond.

Why is not more frequent use made of our hardy Fuchsias for bedding purposes? They are easily propagated from cuttings, and, if pinched and grown to convenient size in pots, they plant out as easily as Pelargoniums, and yield an abundance of bloom with no suggestion of stiffness or formality. St. Brigid Anemones can scarcely be overestimated as subjects for bedding, and if the bed is first thinly planted in autumn, and a further batch of corms is interspersed a few weeks later, a prolonged season of flowering may be ensured.

Of the rock garden I cannot attempt to speak with any idea of doing justice to alpines in the time at my disposal. So big and engrossing a subject as alpine and rock gardening demands nothing less than an entire lecture; but I would like to say that, in my opinion, one should make up his mind to do one of two things—either set himself to the task of gathering together as varied a collection of the choicest gems and rarities of perennial plants, each individual of which is to be treated as a special treasure with an importance all its own, or else, if he aims at a rock garden of general effect, he should be satisfied to limit the variety of subjects, choosing only those of free growth and prolific flowering propensities, and planting these in broad masses, so that, viewed from any point of vantage, the eye may sweep over an undulating carpet of bold and effective colours,

THE CULTIVATION OF VEGETABLES.

By Edwin Beckett, V.M.H.

[Read March 13, 1917; Rev. J. Jacob in the Chair.]

There is no gainsaying that the increase of our food supplies must be of untold benefit to the community at any time, and especially in these critical days.

The writer of an article in one of our weeklies puts the matter very forcibly when he says that, for the very sake of the security of our national food supply, there is urgent need of a greatly increased production at home, and greater employment of men on agricultural land. He further states, what some of us have been emphasizing for years, that our home production of food is infinitesimal, and in the event of a successful blockade of our coasts we should soon be reduced to a state of starvation.

Home production of food would develop the country's resources, and so reduce our indebtedness to, and dependence upon, foreign lands. At the same time it would "colonize England," and give a much-needed stimulus to the decadent agricultural and horticultural industries.

It has recently been estimated that there are at least seventeen million acres of waste land in the British Isles, out of a total area of seventy-seven and a half million acres, and if only one-half of these, at present, unproductive acres could be brought under cultivation, an enormous benefit would accrue to the nation at large. This applies especially in the direction of vegetable cultivation, when it is considered that, in the years 1913 and 1914 respectively, no less than £6,000,000 and £5,500,000 worth of vegetables were imported from abroad, practically the whole of which could have been raised at home.

It was originally my intention to present for your consideration a paper on the cultivation of the culinary pea, but, after the strong appeals made by the Prime Minister and Mr. Prothero regarding food production, I ventured to write our Secretary suggesting that a more opportune subject would be Vegetable Cultivation, and I was exceedingly pleased to receive a reply from him concurring with the idea.

There are many who would do their share, and even more, in the national work of food production on allotment and small garden, who have only very vague ideas of commencing and advancing the cultivation and cropping of a plot of ground. These are the folk who need helpful advice from the members of the Royal Horticultural Society, and, even though all such members are experts, yet points

can be gleaned from each other, so that, in presenting my ideas in this paper at such a time, I need not, I feel certain, make any apology.

Preparation of Ground.—An old cookery recipe started with the words "First catch your hare, then cook it," and this could to-day be paraphrased into "First get your ground, then crop it." In between these two stages, however, lie the most important details of cultivation. The land may very likely be rough pasture land, or waste ground, or perhaps an old, long-worked garden, but in each and every case the secret of success is in the proper working of the soil. There is no question but that the most important operation is trenching (or soil-moving) to a depth, where possible, of from 2 feet 6 inches to 4 feet, with the object of draining and aerating this depth properly, in order to render it ideally workable and fruitful. I believe in bringing the subsoil to the surface, when trenching, in order to render the whole of top-spit and subsoil one homogeneous mass of good material, whatever its nature.

Of course, in this paper, where I mention trenching, I refer to the ideal and approved methods which should rightly be carried out in autumn or during the open weather in winter and early spring; but, unfortunately, owing to lack of man-power, much will have to be performed less well than it should be, and in many cases late, this year. The earlier, however, it can be done the better, in order to reap the highly beneficial actions of frost and wind, sun and rain. Where exact methods have to be abandoned, the best substitutes must be employed, and if we find an enthusiastic amateur, late in beginning, who is likely to be deterred from making a start owing to the labour of trenching, we must tell him to do his best. If he cannot find time to do by far the best thing for his ground, by trenching it deeply, induce him to double-dig, or even single-dig, his plot, as it will be more in the national interest to reap even a light increase by his labours than no crop at all.

When the area for cultivation is too large to be prepared by spade work, a small plough can be used to much advantage, but care should be taken, where ground is of the nature of rough pasture, to remove, by grubbing, wiry tussocks before such operations commence, or they will prove a source of very much trouble and extra labour in after days.

Double-digging, or bastard trenching, is carried out similarly to trenching proper, but only two spits deep. In single digging it is important that the spit of soil should be inverted as it is dug. I do not, of course, recommend the last method, but it can be employed by a late starter, for better this than nothing.

Drainage.—In conjunction with trenching, or deep digging, too much stress cannot be laid on the necessity of drainage of kitchen gardens, either by natural or artificial methods, to a depth to which the ground is worked. This will effectively prevent the soil from becoming water-logged and packed, and will keep it sweet, provided a good method of drainage having an efficient outlet is adopted.

My preference is for agricultural drain-pipes covered with coarse brick rubbish or gravel, or a combination of both. This method will prove serviceable and effective for a number of years.

Manuring.—This is a big subject which, for the purpose of this paper, must be confined to very narrow boundaries. Manuring in horticulture is a very important matter, nearly always a source of deep mystery to the average amateur cultivator, and even, in some cases, to professional gardeners. In dealing with the mystery, let us first of all consider the purposes of manuring.

What do we manure the ground for? Manuring is for the purpose of rendering soil fertile or sweet, of a proper constituency for producing vegetable growth, and to supply those mineral salts necessary for feeding plants in which the particular soil being treated is deficient.

There are two main forms of manure, viz. Natural and Artificial. Under the former heading (Natural) I would group such as animal manure and guano, decayed vegetation, leaf-mould, and seaweed, and under the latter all forms of chemical manures, including wood ashes, lime, soot, &c.

Natural manure should be used in preference to artificial, as in this form the principal foods for plant life are found in their best forms, which are so difficult to reproduce or imitate, with effective results, in artificial manure.

Manures act in different ways according to the soil, and therefore care should be exercised in selecting the manure requisite for a plot. On heavy soil long stable litter is by far the best, as it helps to lighten the mass, and decaying vegetation will here assist, but on a light or sandy soil cow or pig manure is best, owing to its effectively combining with the loose earth, to make a suitable soil from which plants can properly obtain their nourishment.

The use of lime is a matter requiring careful consideration, as many soils contain it in some form or another, such as lime, chalk, limestone &c. If soil contains much lime, it is, of course, a waste of time and money to add more, but if there is a deficiency, it must be made up. A soil without sufficient lime is generally sour or acid; this can be tested easily, as there are one or two simple tests which can be applied for soil acidity.

An old garden, which has for years been heavily manured, should, for a change, receive a good dressing of lime and wood ashes, be deeply trenched in autumn, if the soil is heavy, or in spring, if light, and it will be found to be re-established with the necessary cultural properties.

Quicklime destroys soil pests, and is very beneficial where members of the Brassica family suffer from "Clubbing."

Seaweed is as good as farm manure, and, where obtainable, should be applied fresh on heavy soils and in a partly decayed state to light or loamy soils.

Guano, or bird manure, is very rich, going eight times as far as horse manure, but care should be taken in storing it to keep it as air-

tight as possible, as it rapidly decomposes and loses its valuable properties when exposed.

So many excellent brands of patent manures are now sold that it would be invidious to mention any particular one. These manures are principally useful for applying during the free-growth period of a crop, and many will often act like magic in promoting development of plant life.

Rotation of Crops.—Most vegetables dislike cultivation for two successive seasons on the same site, and a little forethought is profitable in arranging the planting of crops. A good idea is to prepare a plan of the ground showing the arrangement of crops for three or four years, and work according to it. By a little care one crop can follow another, and find left in the soil just what is necessary for its food discarded by the previous crop, which has depended on other matter. For instance, Celery can be followed by Peas, which in turn can make way for Winter greens or Leeks, whilst Onions can succeed Cabbages, and so on.

All members of the Brassica family should, as far as possible, be planted on a fresh site each year, and it is advisable to allow a couple of seasons even to elapse before returning to the same place with any member of the tribe again. This remark also applies to Peas. If it is necessary, owing to lack of space, to return with the same crop, deep trenching should most certainly be resorted to prior to planting.

On the other hand, there are some vegetables which prove exceptions to the rule, and of these Onions, Leeks, Shallots, Artichokes, both Globe and Jerusalem, Horseradish, and Carrots will thrive well on the same site for a number of years. Potatos too, provided the land is deeply worked each winter, can be successfully grown on the same ground for several years, suitable enrichment being of course necessary.

Intercropping is a matter of considerable importance at the present time, when it is essential that all the return possible should be obtained from the soil. Many will now find their plot of ground restricted in size, but intercropping can be practised with very beneficial results.

I have been very much interested in intensive culture for many years past, and have managed to find a certain amount of time for experimental intercropping. A brief account of intercropping on a small plot of ground, measuring about a hundred yards long and twelve yards wide, undertaken last year, may prove interesting, as showing what can be done to produce vegetables all the year round.

The plot had been trenched three feet deep the previous season, to obtain the highest results from deep tillage and drainage, and we had reaped splendid crops of Cauliflowers and Broccoli from it. Early last year a small plough was obtained, as shortage of labour, combined with a wet early spring, effectively prevented any attempt at spade-work. The plough was a success on this plot and other land near by.

The land was first thoroughly dressed with decomposed garden refuse, ploughed twice during March, and then harrowed down to a fine tilth. About the middle of April Cauliflowers were set out in

rows, 3 feet apart, with 2 feet 6 inches between the plants. On each side of the plot a row of Peas, running east and west, was grown. On June 8, in the same rows as the Cauliflowers, between the plants, Brussels Sprouts and Victoria Kale were planted, whilst *between* the rows Leeks were put in at one foot apart for six rows, and Turnips were sown between the remaining rows. As the Cauliflowers matured, they were cut, the ground cleared and deeply hoed.

The whole result was absolutely satisfactory, and the Brussels Sprouts &c. have been, and are still, a first-rate crop.

This idea can, of course, be extended, altered, and elaborated upon in various ways, but it serves to illustrate what can be done in the direction of intensive cultivation.

Sowing, Thinning, and Planting.—The word "intensive" calls to mind what is far too often a fault in vegetable culture, the overcrowding of plants. Too frequently do we see poor, struggling crops suffering from the mistake of planting too closely together, and with insufficient space between rows, and especially so is this the case with Peas and Beans, vegetables which people usually sow far too thickly. Not only does this thick sowing waste seed and labour, but it has the damaging effect of weakening the seedlings, and they never recover from this. A good rule is to only sow twice as thickly as plants are to grow and thin out when the seedlings are quite small.

When sowing small seeds, the soil should be raked down to a fine tilth, and the seeds only covered by their own depth of soil. It is profitable at the time of sowing to take the necessary steps to keep off enemies such as slugs, birds, mice, rats, and ground game.

To plant out efficiently, practice and care are required. The seedlings must be carefully handled, planted with the aid of a trowel, some of the finest soil worked round the roots, and the ground made firm, but left loose at the ground level to prevent the seedlings damping off. The plants should be watered in at once, and if necessary, shaded until established.

In all well-ordered gardens, large or small, the crops should be correctly labelled as they are planted or sown. Ordinary wooden labels 15 to 20 inches long, and from 1 inch to 1¼ inches wide, are most useful. Paint each with a coat of white paint, and write the name on with a pencil whilst the paint is moist, adding date of sowing or planting, and seedsman's name for reference.

Hoeing, Mulching, and Watering.—These three operations are very closely connected, and are very important. By keeping the hoe constantly at work between growing crops, the troublesome weeds are defeated and destroyed, whilst the top soil receives that great benefit—aeration; also the soil, when in a finely broken, loose state, retains moisture far better and does not crack like unattended soil.

Mulching is resorted to as a means of conserving moisture during hot, dry weather, and the operation consists of spreading a good layer of long stable litter, or similar material, about growing crops. It is of considerable advantage, from the point of view of keeping the soil

moist, if the latter is well hoed first, and watered, prior to mulching, then much labour is saved with the watering-pot when the sun burns down and the wanted rain does not come.

I referred just now to watering. Here is where many cultivators fail. Where seedling vegetables are in frames prior to planting out, water very carefully and air freely, or serious damping off will occur; the soil also will sour if these precautions are not exercised, and it is far better to stint the plants slightly than to over-soak them. When plants are set out in their final growing ground, and the dry weather comes along, then give the plants a proper soaking now and again; a light sprinkling every day will do the plants very little, if any, good, as it is deep at the roots that plants require water.

An occasional good soaking with manure water, during the period of active growth, will do many plants a lot of good, and this applies especially to Cauliflowers, Celery, Leeks, Peas, Beans of all kinds, and Vegetable Marrows.

Tools and their Upkeep.—It is always a mistake to endeavour to make shift with a short supply of tools, and, when purchasing them, see that they are the best obtainable, as such are always the cheapest in the long run. Another important point to remember is, to keep them in good condition. See that they are properly cleaned at the end of the day's work. Never put them away with wet, sticky soil adhering to them, but clean it off, and wipe the damp parts of the tool with an oily rag to preserve it in a good condition. No workman can do himself justice with defective instruments, and one always sees that the better the workman the better kept are his tools.

The Use of Frames.—Big growers, of course, realize the value of frames for early supplies and preparatory work for the main crops, but, unfortunately, the amateur generally does not, and it is remarkable how many allotment grounds and gardens are without a frame on them. The cold frame is by no means difficult to manage, and repays its cost by the saving reaped through its utility.

In the early part of the year seeds can be brought on ready for planting out, and here especially the tyro will benefit, as with good seeds he gets good stock, whilst too often does he rely on the local nurserymen with bad or inferior stocks of too frequently dried-up plants.

Later in the year the frame can be utilized for various crops, such as Cucumbers, Melons, Tomatos, and late-sown Carrots, &c., whilst in late autumn and winter the frame can again be used for many kinds of vegetables which require a certain amount of protection.

The Soil Shed.—A shed should always be set aside, in a well-ordered garden, for storing the various soils and manures, so that they are ready to hand as required from time to time. This shed must always be kept well-drained and tidy, and a neat cleanly soil shed is by no means an unsightly portion of a garden, provided that it is well looked after, but, if allowed to get untidy, it can prove a very bad eyesore indeed.

General Remarks.—Never purchase seeds because they seem cheap. A good strain of seed from a reliable seedsman is always the most economical in the end. Slovenly work in a garden always entails a lot of after-labour. All work should be as effectively and tidily done as possible, and there should be a place for everything and everything in its place; especially does this apply to tools.

Stake heavy-topped vegetables, so as to support the stem, as no plant can do its best whilst one side is pressed down to the ground.

Always endeavour not to be late in planting or sowing, as a week late will possibly make every difference in the world when it comes to the harvest time for crops. Whilst bearing this carefully in mind, care should yet be observed not to sow seeds in the open under conditions of weather and soil which are such that germination cannot effectively occur, or time, labour, and seed will be wasted.

Cultural Details.—It is now my desire to occupy your attention with slightly more detailed points on the cultivation of various vegetables, confining myself to those kinds which are of most value as food during these critical days. Crops like Peas, Beans, Asparagus, &c., I propose to omit, as these can hardly be classed as utility vegetables.

The Potato.—Unquestionably this must be considered the premier vegetable food of the British Isles, and, despite the fact that many hold the opinion that Potato-planting may be overdone, my advice is that they should be planted freely during the coming season, from a national point of view.

Prepare the ground well by deep working. Procure the varieties which do best in the particular district where they are to grow, and use well-prepared seed, if possible greened and sprouted before they are put into the ground. Too great stress cannot be laid on these last two points, for it is little short of marvellous the difference in the crops from properly prepared sets, as against the produce of seed taken direct from heaps, or clamps, and put straight into the ground. Too many, however, neglect these preliminary details.

When planting, allow plenty of room between the rows and sets, as overcrowding is a frequent aid to the spreading of disease. The rows should be 3 feet apart for strong-growing varieties, with about 20 inches between sets. The space between is not waste, as, when earthing up is finished, the furrow left can be planted with Brussels Sprouts, various Brassicas, &c.

When the haulm appears, keep the hoe busy earthing up the rows; this is one of the most important items of Potato-growing.

Lift the crop early, as it is far better to dig it rather under-ripe than over-ripe and disease-infected. If some of the tubers get surface-rubbed in lifting, it will make no difference, as they form a new skin very rapidly where the old skin is damaged. This I have proved over and over again.

Onion.—Next to the Potato, in importance, comes the Onion, and this year their cultivation will doubtless be enormously increased.

In the past we have depended far too much on importations from abroad, for our soil and climate are ideal, where proper cultural methods obtain. I consider the best way is to sow in boxes, or cool frames, from early February to the middle of that month, scattering the seed thinly, and, when the plants reach a suitable size, put them out, after well hardening, into well-prepared ground of fine tilth, about 15 inches apart from row to row, and four inches from plant to plant. Make the ground firm, and well water in. Onions are very hardy, and, if well prepared, no frost after the beginning of April should harm them. By this method of treatment, the bulbs mature earlier, and are better for keeping purposes. They also escape the Onion Fly's unwelcome attention, produce a heavier crop, and enable the ground to be cleared for other crops much sooner.

Carrot.—Unless the ground is suitable for growing Carrots, it is much better to raise other crops in their stead, as in many districts the Carrot refuses to thrive. Where it will grow well, it should be raised extensively, owing to the continual demand for it.

Cabbage.—The utility of the Cabbage is unequalled amongst green vegetables. It is available for use all the year round, in some form or another, and, where various sowings are made, a garden need never be without a supply. Another thing to commend it is, that it is one of the easiest forms of vegetable to grow; anyone can raise it, even the veriest novice hardly being able to fail.

Parsnip.—This is one of the most desirable vegetables to cultivate. It is highly nutritious, but requires a long period of growth, and should be started, if possible, in February. The soil should not be too rich, but requires to be deeply worked. Avoid the older varieties, as there is no comparison between them and the newer and better kinds.

Brussels Sprouts.—No garden should be without Brussels Sprouts, for they are one of the most hardy and prolific vegetables for winter use. To obtain a succession of firm succulent Sprouts from September until the end of March two sowings should be made, one in March, and the other at the end of April.

Celery.—This is one of our most wholesome and delicious vegetables. It is always in good demand, and of the highest value as food, both cooked and raw. There is, in my opinion, no crop that benefits and improves the ground more, leaving it in a fine condition for crops following it. Its native home, whilst in a wild state, is a damp swampy place, or a ditch bottom, and consequently Celery always requires a deal of moisture, and especially in the seedling stage, dryness then being a common cause of failure in cultivation. Too early sowing also has a bad effect, resulting in premature flowering. The second week in February is the earliest that seed should be sown. For winter crops grow a red or pink variety, as they are more hardy than the white. Choose the seed from a reliable firm, and make sure they are a good variety, as there are so many worthless sorts on the market.

Celeriac (Turnip-Rooted Celery).—In this country Celeriac deserves

far more extended cultivation. It is wholesome, appetizing, and nutritious, with a flavour between those of Celery and Parsnip, and in the young stage should be treated in the same way as the former, but grown on flat ground. The soil requires deeply working, and should be heavily manured. It requires abundance of water—in fact, it can hardly have too much; and the Dutch hoe should be busy, periodically, on the soil round about it. Lift in autumn for storing in dry ashes, or sand, and it will keep good all the winter.

Beetroot.—An ideal site for Beet-growing is the plot from which Celery has been lifted. It is, perhaps, not such an important vegetable as many others, but is such a favourite that some should be grown in every garden.

Borecole or Kale.—Taken as a group, there are no vegetables grown that are so valuable, in the winter months, for supplies as are the Borecoles or Kales, and, from a productive standpoint, they have no equals throughout winter and spring. They are very hardy, resisting long sharp frosts, and are delicious in flavour. The best kinds are the Scotch and Cottager varieties, and these should be seen in every garden, never mind how small. They are not particular with regard to their location, or the soil they are grown in, provided it is well worked, and they will succeed in anything, from the lightest loam to the heaviest clay, though they are found at their best on soils of a heavy texture. It is a valuable vegetable for intensive culture schemes, but requires a sharp watch to be kept for "Club Root" disease.

The true Labrador Kale is distinct, very prolific, and of quality unequalled.

Savoy.—Another hardy member of the Brassica family, valuable in mid-winter, as it is a good frost-resister; in fact, it is certainly better in flavour if cut after a frost. A common source of failure is too early sowing, which causes the crop to be spoiled before the middle of winter arrives. It should be at its best during January and February, and, to ensure this, should not be sown before the second week in April, the first sowing being followed about three weeks later by another.

Leek.—Our Scottish friends can still teach us much regarding the value of Leeks. The plants are extremely hardy, as no amount of frost harms them; they can be had for culinary use from August to April, and when well grown, and properly served, are very appetizing, and not outclassed by any other rival in the vegetable world. Every garden should contain Leeks, and gardeners should grow more than they do.

Mushroom.—These are an extremely palatable food, making a choice substitute for more substantial dishes, and are always in large demand. Wherever fresh horse-manure is obtainable, they should be grown, either under cover, or in the open.

Chicory.—We should certainly cultivate this more extensively; on the Continent it is very largely grown, and is a valuable vegetable

in both cooked and raw states. It requires sowing in spring on well-prepared ground, and should be lifted and blanched in a cellar, or mushroom-house, during the winter, at any time.

Pumpkin.—Unfortunately, this is a vegetable the culture of which is much neglected, though it is undoubtedly of high food value. To cultivate it is far from difficult, as its main essential is a sunny position, and, this attained, it can be grown, even on a rubbish-heap. Pumpkins need not occupy much space, for they can be trained up a wall or a pergola, and, in fact, are really ornamental in their growth.

When the fruit begins to swell, it must be exposed to the sun, and when cut should be stored in a dry, frost-proof room for winter use, when, if cut like a cheese, a Pumpkin will keep in a perfectly good condition for two or three weeks, provided that it has properly ripened.

Spinach Beet (*Perpetual Spinach*).—Though not generally considered a very high-class vegetable, yet, on account of its prolific habits, giving supplies throughout the year, it should be largely grown. Sow about the middle of March, and thin seedlings to 9 inches apart. When the leaves, which are the edible portion, are ready to pick, the plants will continue to supply fresh leaves for fully twelve months. Nicely cooked, this vegetable is very similar indeed to ordinary Spinach.

Turnip.—During autumn and winter the root portion, and during spring the greens, of both white and yellow varieties of Turnips and Swedes are very valuable as food, though possibly not so nutritious as other vegetables. To obtain best supplies for winter, Turnips should not be sown before the end of August, or the beginning of the following month.

Tomato.—It may appear strange to include the Tomato in a list of war-time vegetables, for most people look on it rather as a luxury, but there is a reason for so doing. In the hot days of summer and autumn a well-ripened Tomato, either with a moderate amount of cold meat or even without it, will make a good and satisfying meal. Consequently, they should appear in every garden, either under glass or trained against a wall or building. In my opinion the finest variety yet produced is 'Sunrise,' whilst its golden sport, 'Golden Sunrise,' is the best yellow variety we have.

Kohl-Rabi.—The mystery member of the Brassica family is one which, during the critical times ahead, may well prove its value as a food. It is not generally cultivated in Great Britain, except on farms for cattle-feeding, but when it is about the size of a turnip it is very nice for culinary purposes, and should undoubtedly be grown everywhere now, especially on hot dry soils, which suit the Kohl-Rabi well.

Vegetable Marrow.—Everyone who has a little space of ground should grow Marrows. Endeavour to start the plants early on a mild hot-bed, in portable frames, in order to make the productive season of as long duration as possible. The frames can be moved away when safe to leave the plants without their protection.

Ripe fruit can be stored and used in much the same way as

pumpkins, and they are also useful in making a very excellent and favourite jam.

Jerusalem Artichokes.—These, when nicely cooked and served well, make an admirable Potato substitute, and are perhaps the easiest of all vegetables to grow, as well as one of the most profitable. Once the seed tubers are put into the ground, the plants require practically no attention, and will thrive in any soil. Owing to its strong and handsome foliage, it is of much utility as a screen to hide unsightly spots, and so proves itself useful in a dual capacity. For culinary purposes, the white variety is far preferable to the red kind.

VIOLETS AND THEIR CULTIVATION.

By J. C. HOUSE, F.R.H.S

[Read March 27, 1917; Mr. E. H. JENKINS in the Chair.]

THE Sweet Violet, *Viola odorata*, is found all over Europe and in many parts of Asia, and also in North Africa. It was noticed by travellers a hundred years ago, in Palestine, China, Japan, and Barbary.

The first notice of the cultivation of Violets, as far as I am able to discover, is a statement by THEOPHRASTUS, that they were grown and sold in Athens about the time of the destruction of Herculaneum and Pompeii. HASSELQUIST says that the Sorbet of the Turks is prepared from Violets and sugar. HOOKER had heard that Highland ladies prepared a cosmetic from Violets, and he wonders how they obtained the blossoms, as the Violet is rarely found in the Highlands of Scotland. "Yet," he says, "the plant was known to them, if the following lines given by LIGHTFOOT are correctly translated from the Gaelic: 'Anoint thy face with goat's milk in which Violets have been infused, and there is not a young prince upon earth who will not be charmed with thy beauty.'"

Viola odorata in colour is white, deep purple, and occasionally lilac or reddish purple. It is the parent of the Sweet Violets in cultivation to-day. LOUDON says that the Neapolitan Violet is a variety of *V. odorata.*

In JOHN MILLER'S catalogue, published in Bristol in 1826, I find four double Violets offered—white, blue, mauve, and purple. In WM. ROLLISSON'S catalogue, 1875, I find seven Violets offered, six of which are doubles.

In the early Victorian period, Violets were cultivated more largely in Italy and France than in this country. In the neighbourhood of Bath, in the 'forties and 'fifties, there were a few rather extensive and successful cultivators. They sold their produce in the Bath and Bristol markets. Their varieties were the single Russian, the double Neapolitan, and a variety which they called *arborea.* They cultivated this in pots. It was a fine dark double purple, and very fragrant. It has appeared under several names, but I think there was no justification for calling it *arborea.* They had a knack of growing a crown on the end of a runner, and training it in the shape of a little umbrella. I think it is still offered by MILLET under the name of *arborea.* It is very much like 'King of Violets' or 'Bertha Barron,' and I think both of these varieties could be grown in this fashion without much trouble.

For many years the only single Violet in commerce in this country

was the Russian form of *odorata*, afterwards called 'The Czar.' About 1860 or 1870 a man named GEO. LEE, who lived at Clevedon, in Somerset, sent out a Violet which he called 'Victoria Regina.' He said that he believed the mice had sown the seed. 'Victoria Regina' was a distinct advance on 'The Czar.' It was more highly developed in form, better in colour, and flowered freely in autumn. For several years LEE made a practice of sending a big bunch of 'Victoria Regina' to her Majesty Queen Victoria at Balmoral, and these gifts were always acknowledged. I think LEE also gave us *odoratissima*. The old man died a few years ago at the age of ninety-seven. I never met him, but he used to send his good wishes to me as being a kindred spirit in some ways.

Wellsiana made its appearance shortly after 'Victoria Regina,' which it somewhat resembled. Its chief merit, however, is to be found in the fact that it begins to flower quite early in the autumn.

'Marie Louise' has been known under many names on the Continent of Europe for sixty years. SCHUER of Heidelberg advertised it as the best Violet of the Parma class.

There is a note in the *Gardeners' Chronicle* for 1884 respecting 'Lady Hume Campbell.' It was stated that the Violet had been brought from abroad several years earlier by Lady H. CAMPBELL and planted in her garden at Highgrove. Mr. TURNER noticed it there, and, I believe, purchased the stock.

A great stimulus was given to Violet culture by the appearance of 'California,' an American introduction, the first of the giant Violets. This was followed quickly by 'Princess of Wales,' which appeared from several sources under several different names.

I think that is quite enough about the early history of Violets, the rest is probably within your memory.

There are a few flowers which will probably command undying popularity. The number is strictly limited, but the Violet holds a prominent place amongst the favoured few. A handful of 'La France' Violets, grown to their fullest capacity, will probably hold its own with anything which can be produced in the stove or the orchid-house. The form of a well-grown, highly developed single Violet is exceedingly beautiful; the season at which Violets naturally bloom is the season when flowers are most highly prized; but the outstanding charm of the Violet is its incomparable fragrance. The sweetest-scented Violets in my judgment are *argentiflora*, *semperflorens* (or 'Quatre Saisons'), 'Neapolitan,' and 'Mrs. J. J. Astor.' The complaint is often made that the giant Violets are not so highly fragrant as the smaller varieties. I think people say this for the same reason that they say "It's too good to be true." It may be—but I am not sure of it—that what we have gained in size and form we have lost in perfume. This thought is an old one with many of us. In strawberries we gained in flavour in 'Dr. Hogg' and 'British Queen,' but we lost in beauty of berry and vigour of plant. The same thing is true in apples. 'Ribston Pippin' and

'Cornish Gilliflower' are not the most attractive in appearance, but there is no question about their flavour. So it may be that we have lost something in fragrance in the giant Violets; but, as I said before, I am not sure. In the days of our childhood we gathered Violets in the garden of our old home, and we shall never forget the fragrance of those days. Perhaps our sense of smell is not so keen as it was thirty years ago, or perhaps we *buy* our Violets now, and that makes all the difference. But with regard to the perfume of the giant Violets, I mention two or three facts which I have noticed.

Vases which have held the blooms will retain their scent for weeks after the flowers have been removed.

In a crowded Chrysanthemum show, I have often heard people say, "Oh, where are the Violets?" when I have been standing by one of our exhibits. And a flower-show is a difficult place to determine particular perfumes.

I remember hearing my father say that he went to the parcel office at Paddington for a box of Violet blooms, and the man in charge told him they had not arrived. But my father was perfectly sure he could smell them, and presently they were found.

But there is some other subtle, indefinable charm about Violets. When I was a boy at a school near Bath, I remember that we would almost fight over the first white Violet in the Claverton hedgerows. There was no other flower which we boys loved quite as much as we loved this flower.

You will want me to say something about the cultivation of Violets. Well, at the outset, if you are half as much excited about Violets as I was twenty years ago, you will make them grow by hook or by crook. How often people have said to me, "Ah, but you have some secret about Violet growing, and that is why you succeed." Well, I had a secret, I was in love with them—I still am, but I fear that in the last twenty years I have carried on a wild flirtation with Sweet Peas and Alpine plants. And a few other sweethearts were beginning to find a place in my rather susceptible affections when the war broke out, and we have had to look rather coldly on these darlings of ours ever since. We have been forced to make friends with *Solanum tuberosum*, and I have thought several times these last few days that it would have been far more sensible for the R.H.S. to come to Westbury-on-Trym and help me with my potato-planting, than for me to journey up to London to lecture on Violets.

Well, we will one day be reconciled to our old sweethearts, and go back to our peaceful gardens once again, when the turmoil of these war days is ended.

To grow Violets successfully, I think you must have a tolerably clear atmosphere. I do not think I have ever seen Violets doing well in a town. The growers at Hampton told me fifteen years ago that they could not grow Violets at Hampton, though, fifteen years before that, Hampton was, I think, the chief Violet locality for the London markets.

Violets will not thrive for any length of time in stiff, heavy soils, and I do not think it is possible to obtain the best results on light, dry, or sandy soil. If the character of your soil approaches either of these extremes, it will repay you to make a plot for your Violets. In Mr. B. T. Galloway's little book on Violet cultivation, he says: "We may have in one part of a field a soil containing 15 per cent. to 20 per cent. of clay, and in another one containing 4 per cent. or 5 per cent. By mixing these two soils in equal proportion a combination is effected which, other conditions being equal, will prove better for Violets than either soil used alone." I agree with that.

The best way to propagate Violets is by rooting runners in the autumn months. Where Violets flourish, runners will be produced in great abundance. The stoutest and shortest jointed should be selected, and taken from the plants when they are 3 or 4 inches in length. Dibble the cuttings in light sandy soil, in a frame, facing south, and let the bed be as near to the glass as possible. They will root rapidly if you will give them the usual treatment required by cuttings under such conditions, and when once rooted they may be freely supplied with light and air. Wet will injure them more than cold, but the frames should seldom if ever be kept quite close.

In early spring, as soon as the weather will allow of it, the young plants should be lifted and a selection made. The long, stringy plants, and those which show no disposition to form a crown, should be rejected; the short, stiff, and stocky plants being lined in again to make a little more root and to receive protection from the bitter east winds which we often get in the month of March.

The planting out may be done as early as the middle of April. A cool, fairly moist situation is desirable. I used to argue for a partially shaded position, such as the north side of a garden wall. In such a position I have seen them do exceedingly well. But although this may not be indispensable, I am sure that they will require to be cool and moist at the roots during the growing season. The distance from plant to plant will vary from 10 inches for 'Lady H. Campbell' to 16 inches for 'Princess of Wales' and 'Luxonne.' I can tell you in a very few words what are the chief requirements of Violets from May to September. Scuffle with a Dutch hoe every few days during dry weather. Dust a little old soot over the plants every ten days or so, and spray the Violets with soft water as often as you like at the close of a hot day; and cut off the runners as soon as they appear. We used to plant our Violets in beds of such a shape and size that eight or ten 6 × 4 pit lights would nicely cover the beds. We would run an 8-inch board round the beds to support the lights, and thus save ourselves the trouble of lifting the Violets into frames. The finest blooms we ever exhibited were gathered from these undisturbed plants. That plan of course is not always feasible. Violets may be lifted into frames from August to October. I should say the first week in September was the ideal time. Do not lift too soon, do not feed too highly, do not nurse too tenderly. The aspect of the frames should

be south or south-west, for whilst it is quite possible for Violets to get too much sun in summer, it is impossible to give them more than enough in winter.

The compost should contain some leaf soil and sand, and if any thoroughly rotten stable manure be available, a small quantity may be added to the other ingredients, the chief element, of course, being good ordinary loam. Plant the Violets firmly, and so arrange the soil that the top leaves will almost touch the glass.

The distances will vary from 9 or 10 inches for the doubles to 12 or 14 inches for the singles.

They may be kept tolerably close for a day or two, until the roots begin to move, then the more air they receive the better they will thrive. The chief use of the lights is to keep off the excessive rains. Too much water in winter will do Violets more harm than a little frost, and the only protection required in an English climate can be obtained by spreading Russian mats over the lights on the coldest nights.

During the winter months remove all yellow and decaying leaves, and keep everything sweet and clean, stirring up the surface occasionally, and top-dressing the beds now and then with a mixture of soot and fine soil. When compelled to water, let it be done on a mild morning, and do not wet the leaves more than is necessary.

With regard to the hardiness of Violets, the more highly developed varieties are less hardy than the old sorts. The 'California' and 'Luxonne' family are hardier than the 'Princess of Wales' and 'La France' group. 'Noelie' is very hardy, and very useful for cold localities. The doubles of *odorata* type, such as 'Belle de Chatenay' and 'Bertha Barron,' are much hardier than the Parma doubles.

I very much question whether LOUDON was right in suggesting that the Neapolitan and Parma Violets are varieties of *odorata.* Neapolitan doubles sometimes go single, and the whole character of the Neapolitan family is distinct from the hardy single Violets of our early recollections.

VARIETIES.

I suppose I could give you a hundred names and descriptions; but is it wise in these days, when we are eliminating all unnecessary things?

The following, as far as I know, are the best sorts yet raised.

Singles.

'La France.' A giant Violet, compact in habit, and of rich deep colour.

'Princess of Wales.' Longer in stem than 'La France,' but not quite so rich in colour.

'Noelie.' A good hardy Violet, which flowers freely about Christmas with very little assistance.

'Queen Charlotte,' 'Askania,' and 'Baronesse de Rothschild' are probably slight but appreciable advances on 'California.'

Of the old type of single Violets the best examples are 'Wellsiana,' 'Victoria Regina,' and 'Admiral Avellan.'

Other interesting single Violets are 'Sulphurea,' 'Argentiflora,' 'John Raddenbury,' and 'Semperflorens,' which is about identical with the French 'Quatre Saisons.'

Doubles.

A few years ago it would have been impossible to deny the place of honour to 'Marie Louise.' But 'Queen Mary' and 'La Belle Paris' are distinctly better. The former is finer, and the latter freer in blossom.

'Lady Hume Campbell' is still the best of its class. 'Neapolitan' and 'Mrs. J. J. Kettle' are similar. Both are extremely delicate in colour, and of delightful fragrance.

'Comte de Brazza' is the best double white.

Other interesting doubles are 'Mrs. J. J. Astor,' with a remarkable colour and penetrating perfume; 'Madame Bertha Barron' with symmetrical black-violet blossoms; and 'Belle de Chatenay,' which gives fragrant flowers like double white Primroses.

I have spoken about Violets blooming at a season of the year when flowers are scarce. But as a matter of fact, with a little management, you may have Violets in flower for ten months. I bought seventy rooted cuttings of 'Semperflorens' at 1*s.* each some years ago. I bought them in the spring, and grew them on well. By July they had made good clumps and were smothered with blossoms. I was very proud of them, and I well remember a florist who saw them offering me 5*s.* a clump. He said that some people expected Violets all the year round, and he wanted them for wreaths and crosses, as he had never been able to get Violet blooms in July.

'Wellsiana' will follow in August, 'Victoria Regina' in September, and then there is an abundance until Christmas.

'Noelie' is a real Christmas-flowering Violet, a first-class variety, sweet scented, very prolific, and of fair size. 'Lady Hume Campbell' and 'Belle de Chatenay' will flower on well into May, if grown in a cool position.

DISEASES.

I must say a word or two about the chief diseases which attack Violets. The most fatal of all seems to be the fungus disease commonly called "spot," scientifically called *Alternaria violae.* In Volume XXVI., Parts II. and III., of the JOURNAL of the R.H.S., there are three papers on this disease, which deal with it far more trenchantly than I can hope to do. And yet Mr. DORSETT declares "that at present no effective remedy for this disease has been found when it has gained a foothold. The usual spraying with fungicides has produced little

or no effect. The only suggestions made are in favour of prevention rather than cure, by giving careful attention to the production of vigorous healthy plants, in preference to any attempt to check the trouble after it has once gained a hold. Endeavour to secure plants of ideal development. Grow the plants under conditions necessary for producing vigorous healthy growth and protected from conditions likely to induce disease. Keep the houses or frames clean, sweet, and devoid of all rubbish likely to harbour vermin or disease. Propagate only from healthy vigorous stock at the most favourable season. Select each spring none but perfectly healthy vigorous plants from the rooted cuttings for planting in the houses and frames. Old plants are sometimes carried over, but they are not so reliable as the young plants, and much more liable to all kinds of disease. Keep the plants clear of yellow, dead, or dying leaves, being careful to destroy them after removing them from the plants. Keep the plants free from insects and other animal pests. . . . Set the young plants early in the spring in the beds where they are to remain for the season, so that they may get well established before the hot dry weather of summer makes its appearance."

I am convinced that this "spot" almost invariably appears on leaves which have already been damaged by red-spider.

Other diseases are stem-rot and wart disease. I do not know what causes them, and I have seldom seen them. I only suggest, as Mr. DORSETT suggests, that healthy clean conditions, and getting things done at the proper time, is the likeliest method of obtaining immunity from these diseases. And if the plants are badly affected, burn them and get a fresh stock.

And now with regard to red-spider. Mr. B. T. GALLOWAY, in his little book on Violet culture, rightly says that this is one of the worst enemies with which Violet growers have to deal. It is present at all seasons of the year, and ready at all times to begin its destructive work. Such varieties as 'La France' and 'Princess of Wales' are particularly subject to red-spider. 'California' and 'Luxonne' resist it much more effectively. 'White Czar' is seldom touched. The same is true of 'Noelie.'

In doubles 'Marie Louise' suffers worst. 'Lady Hume Campbell' keeps very clean.

Of red-spider it may be said emphatically that prevention is a thousand times better than cure. There are many effective cures for red-spider, but nine out of ten of them will also effectively destroy the Violets. You can get leaflet No. 41 issued by the Board of Agriculture and Fisheries. This leaflet will give you a scientific description of the whole family, a page and a half about its life-history, and a number of methods of control.

I fear, however, that most growers will have to confess that we have not yet solved the problem of the red-spider.

INCREASING THE HOME FRUIT SUPPLY.

By Edward A. Bunyard, F.L.S.

[Read April 11, 1917; Mr. J. Hudson, V.M.H., in the Chair.]

At a time when we are scrutinizing very carefully our home supplies it may be of value to include in this survey the average garden, and to see where and how we may best increase its usefulness in the production of fruit. It is, I think, quite possible to augment very materially our fruit supply from this source alone, and my remarks will be addressed to those who grow or wish to grow fruit for their own consumption. In the average garden which we are considering, the fact that first strikes a fruit enthusiast is the absence of any considered plan to extend the season of fruit as long as possible.

The herbaceous border has had long hours of careful thought devoted to it, so that it may present an ordered succession of bloom throughout a long season, and in most gardens undergoes an unceasing revision. In the fruit garden it is seldom that much trouble is expended on this particular matter.

A vast crop of 'Jargonelle' Pears, far beyond the home needs, is often found, and, after 'Williams' are over, a pearless season is experienced until 'Doyenné du Comice' comes to cheer November days. This superabundance of the earlier fruits is a very common feature of the average garden. A standard Apple or Pear which produces several hundred fruits which will only keep for a fortnight is an obvious mistake for a small household. Such varieties would be better grown as pyramids, and for the large trees mid-season and late fruits chosen. Where, however, such large standard trees exist, or even a large wall tree, the balance can be redressed by regrafting most of the branches. The amateur is too apt to think that a large tree is a *fait accompli* which must be borne with, but a visit to Kentish orchards would show him the fruit farmers often regraft their trees many times till they find the variety which "does" best. Large branches nine inches in diameter of Apple and Pear trees can be quite successfully grafted if the wood is healthy. A few hours' study of a nurseryman's catalogue will suggest how gaps can be filled up and the season extended at either end, and so much has been published on this subject that it is hardly necessary to give lists here.

A few fruits deserve a wider cultivation for their utility in extending the season. Such are Autumnal Raspberries which with varieties such as the 'Alexandra' and 'Hailsham' carry the Raspberry season through till mid-October. These autumn varieties should have the canes well spaced out. The Alpine Strawberries too are invaluable

in filling the gaps between the ordinary varieties and earliest plums. Seed planted in August will come up at once, and the plants should be wintered in a cool house or frame and planted out in mid-April. They will fruit abundantly in July and August. The discovery of the better-flavoured Gooseberries is proceeding apace, and for the children home for the summer holidays they are most opportune. Here, too, the season may be extended by planting some of the late-ripening varieties, such as 'Sandwich Yellow,' 'Lancer,' 'Telegraph,' &c. If there still exists anyone to whom the Gooseberry remains a plebeian fruit, to be honoured once at Whitsuntide and then forgotten, they should try 'Cheshire Lass,' 'Langley Gage,' 'Rosebery,' 'Glenton Green,' and repent at leisure. Too little care is given to gathering fruit, and especially does this apply to the earlier varieties. Both Apples and Pears of early varieties require to be gathered when they are still firmly attached to the tree. 'Williams' and 'Jargonelle' pears, for instance, should be gathered when they present a green and formidable appearance. The golden rule is: Gather early fruit early, and leave the late ones on the trees as long as possible. Mid-season varieties require a midway method. Furthermore, early fruits should not all be gathered at once or they all ripen together. If three or four gatherings are made, even if only at a few days' interval, they will ripen successively. One often hears: "All my pears go soft at the core." This is their protest against a late gathering. A few experiments will soon show how remarkable a difference this successional gathering will make. Thinning fruit is also too little practised, resulting in a prolific crop of marbles one year and nothing the next. It might almost be said that no one as yet has ever thinned too heavily. A slight exercise of the imagination will show that one full-sized fruit left on each spur will be quite sufficient in the case of Apples and Pears. Trees which bear only in alternate years can often be brought back to an annual crop by careful thinning. It is frequently said: "We cannot grow fruit, as we have no place to store it." The reply to this is: "It is not necessary." I know no better way of storing Apples and Pears than to wrap them in paper, put in a box and shut the lid. The box is then placed in a cupboard or shed, marking outside the name of the variety and season it should be ripe. 'Cox's Orange Pippin' may thus be kept in perfect condition till March *if well ripened.* A frost-proof building is not necessary. They may be frozen as hard as stones, as mine were this year, but if allowed to thaw slowly, and I fancy in the dark, they will come out uninjured. Anyone who can provide a box, and a place to store it, should be able to keep late Apples and Pears, without the slightest difficulty. I have tried covering Apples in boxes with sand, sawdust, &c., and all are good from the point of preservation, but they all leave some slight flavour. If an odourless medium could be found, this would be an ideal method for the small grower. A frequent cause of fruit keeping badly is the fact that it is not properly ripened. It may be said that every fruit must receive the kiss of the sun once a day. The soft, green fruits growing in the shade are useless, and the pruner should

bear this in mind during his labours. Every branch must have air and light around it. The fine and well-developed fruits on Espaliers and Cordons are a witness to this fact. It is not often realized that cooking Plums may be stored for some time when gathered unripe, and they will ripen more slowly than on the tree. The gages too can be kept for months in a cool room if sound well-ripened fruits are selected. The skins will be a trifle tough, but the flavour even improved. These two must not be allowed to hang too long or they will become flavourless. A point in the pruning of raspberries may be mentioned here. It is usual in many English gardens for the canes to be tipped off at the same height. If, however, the canes in spring are cut at various heights from four feet to two feet from the ground, the shorter canes will fruit much later and thus prolong the season.

Hand Fertilizing Fruits.

The question of the self-sterility of certain varieties of fruits is yet in the experimental stage, and I am inclined to think much of the evidence so far offered is somewhat unconvincing. It will be well, however, to take every precaution to ensure a crop, and therefore the carrying of pollen (by means of a rabbit's tail on a slender stick) from one variety to another is advisable where fruit does not set freely. A dry day should be chosen and the pollen lightly dusted on the flowers on two or three occasions. Failing a rabbit's tail a wad of cotton wool or a powder puff will answer equally well.

Manuring.

The question of rational manuring of fruit-trees is, I fear, one that is yet neglected in many gardens. It has been said that the persistent starvation of the lawn is a striking feature of the English gardens, but fruit trees stand scarcely second in this respect. The visible response of plants to nitrogenous manures has often led to the neglect of other equally necessary plant foods. First in importance must be placed lime. All fruit-trees require lime, and without it a large amount of other manure is wasted or rendered unavailable. Lime should be applied, when slaked and in the form of a fine powder, at the rate of 21 lb. to the square yard or 3½ tons to the acre. during the winter months. Chalk is equally good, and the gas lime and the waste from acetylene plants can also be utilized with perfect safety, after exposure to the air for a month or two. Nitrogenous manures should be used if the trees are not growing well, but sparingly in any case.

Next in importance comes phosphate, upon which fertility and earliness depend. This should be applied yearly in some form or other. Superphosphate is the most available, and 1 lb. to each 5 square yards or 8 cwt. to the acre will be a sufficient amount, and it is applied in the early spring months. Basic slag, when it can be obtained, is a valuable source of phosphate; apply 6 oz. to the square yard or 5 cwt. to the acre.

On potash depend the production of sugar and the delicate flavours and scents which make so large a part of the attractiveness of our fruits. It is seldom absent in ordinary garden soils, and the lime-dressing should liberate it in sufficient quantities as a rule. Kainit is of course the usual source, but in these days gardeners have to rely largely upon wood ashes.

The manures mentioned above are mostly things which require to be purchased, but there are many domestic waste products which, usually thrown away or burnt, may be used with great advantage in the fruit garden. All bones, after soup has been made of them, are a valuable, if slow, source of phosphate and should be saved and dug into the soil around the larger trees. Any fur or wool waste (old wool rugs beyond hope), rabbit fur, or wool scraps, soot and feathers will all be valuable in the soil and can be dug in during the winter. Ashes from wood fires should be carefully saved in the dry and spread around the trees in winter. Carbide waste from acetylene plants as mentioned above provides a source of lime and disposes of a disagreeable residue.

It is not often realized how much the soils of the garden may be improved by a few years' careful attention. The action of lime in improving the mechanical state of a sticky clay is well known ; the addition of leaf-mould or peat to a dry hot soil will aid immensely in the development of those late fruits which so often suffer from drought in autumn, and are thus hard and gritty or badly shrivelled when the time comes to eat them. While on this subject it may be well to call attention to the danger of neglecting fruit trees after the crop is gathered. Often they are left to struggle through an autumn drought without so much as a thought. The manures as mentioned above will be a great aid, and careful attention to water supply will make them more likely to fruit next year.

Apples, especially those of the Reinette class—'Blenheim Orange,' 'Claygate Pearmain'—and the like, benefit enormously by an annual mulch of leaf-manure, and the later Pears are not less grateful. So far we have considered mainly what may be done with our existing trees ; there remains the very important question as to how we may extend the cultivation of fruit-trees in gardens. In visiting the suburbs the fruit advocate is struck by the habit of planting forest-trees in small gardens. A fine Beech or Lime will often take up a very large part of the garden, and render the soil around very unsuitable for other plants. The Bitter Almond too, without which a London garden can scarcely exist, is a thing of beauty and a joy for a fortnight, but an Apple or Pear in its place would be hardly less beautiful and extend its joy into the autumn or winter. Many barren shrubberies might be made more valuable by the addition of a few fruit-trees—Cherries, Plums, Pears, Crab Apples, &c. In park-planting groups of fruit-trees would well replace the forest-trees which custom has stereotyped. Beauty and shade would always attend them, and if, now and again, fruit was also present it would be all to the good. In view of the great destruction of Walnut-trees in France and

Switzerland for gun stocks, this tree should be more widely planted as a shade tree.

In soils which are not considered suitable for fruit-trees much may be done by amelioration as mentioned above, and it would be well if the *obiter dicta* of local authorities were quietly checked by a few experiments. For instance, it is said that the Cherry-tree thrives only on a lime soil, and of course this is very largely true, but no one who has seen the extraordinary Cherry orchards at Werder, where the trees grow on the driest of sandy soils, would feel too confident in ruling out some further experiments. The subject of lime-loving plants is an interesting problem, and is evidently far from being settled yet.

Experiments might also well be made in those colder parts of the country where fruits do not usually thrive, by planting some of the hardier varieties. The Russian Apples and their descendants stand a remarkable degree of cold in Canada and the United States, and such varieties as 'Duchess of Oldenburgh,' 'Emperor Alexander,' 'Wealthy,' 'McIntosh Red' would be likely sorts to do in far northern regions or for high altitudes. In the Pears, Swiss and French experience shows that 'Beurré d'Amanlis,' 'Louise Bonne,' 'Beurré Clairgeau,' 'Catillac,' 'Williams' Bon Chrétien,' and 'Beurré Hardy' all do well at 3000 feet up in the Alps. In districts where late frosts are prevalent, fruits which bloom late may be a help, and such Apples as 'Royal Jubilee,' 'Court Pendu Plat,' and Cherries as 'Napoleon' and 'St. Margaret's' and Plums as 'Belle de Septembre,' 'Bush' and 'Gisborne's' and 'Belle de Louvain' would be worth trying. On dry soils 'White Transparent' succeeds admirably, as do 'Newton Wonder' and 'James Grieve.' On chalk formations 'Newton Wonder' is by far the most successful, but 'Charles Ross' and 'Cox's Orange' may often be seen very happy in such conditions, and are at least worthy of trial. On dry stony banks Cob Nuts and Filberts thrive when little else will grow, and as a valuable addition to our food-supply deserve more attention than they have hitherto received. In partial shade Black and Red Currants, Gooseberries, and Raspberries can be grown, and nuts also do well under other fruit-trees. Finally, I would appeal to those who have land at their disposal, in districts where fruit is not generally grown, to set apart a small plot for experimental purposes. The further development of fruit cultivation on commercial lines will rest very largely in finding new areas closer to the great consuming centres. Landowners can do a work of very great service to their country by starting small experimental plots in which the best varieties for the district may be found by trial, and thus save many years for those who follow them. An immense amount of time and money have been wasted in trying such experiments on the large scale, and if but a little of that amateur enthusiasm which is now so prevalent in the flower garden can be allowed to flow over into the fruit garden, nothing will, I think, be lost in interest and much gained for the permanent benefit of the country.

SNOWDROPS.

By E. A. Bowles, M.A., F.E.S., F.L.S., V.M.H.

[Read May 22, 1917; Mr. F. J. Hanbury in the Chair.]

People often speak of "the Snowdrop" as though they thought there was but one kind, and even good gardeners frequently fail to notice the points of difference between the numerous varieties of these plants. The object of this lecture is to draw attention to the range of interest and beauty possessed by the Snowdrop family for those who care to look closely into a flower. Of late years too many have come to regard flowers merely as producers of colour effects both in the garden and when gathered to decorate their rooms, and the individuality and charm of variations in form and marking have been much neglected.

It is true that where it is possible to naturalize Snowdrops in great drifts in woodland or other wild ground, no variety is better for the purpose than the Common Snowdrop, that is to say, the single form of *Galanthus nivalis* that has spread so freely in some parts of Great Britain as to be reckoned one of our wild flowers, though it was probably introduced by the Romans. On the other hand, quite a small garden can contain a collection of varieties that should produce a succession of blossoms from October till April, and will provide plentiful interest for those who like to compare the variations of distinct forms.

Before looking at the various species and forms, it is worth while noting some of the more interesting structural peculiarities of Snowdrops.

The Snowdrop is a member of the Natural Order Amaryllidaceae, that is to say, that group of Lily-shaped flowers in which the ovary, or seed-vessel, is below or outside the floral segments, and not above or inside them, as in the Liliaceae; while its six stamens distinguish it at once from the Iridaceae, in which Order there are only three.

The flower is pendent. Its position is reversed at the moment it bursts as a bud from between the two spathes united by thin membranes to form its protecting cover when first it is pushed above ground. It is not entirely due to the weight of the flower that it hangs thus. The flower-stalk lengthens while the bud is still enclosed between the spathes, and takes a sharp curve just below the ovary, sufficient to place the flower at about the same angle as that of most daffodils and many other members of this order, such as *Hippeastrum*, *Amaryllis*, and *Crinum*. The slender flower-stalk and the weight of the flower complete the work and produce the hanging bell. This is an ideal form for a flower opening so early in the year in such change-

able and rough weather, and provides excellent protection from wet for the pollen. The anthers do not dehisce—that is, split open—to discharge the pollen, but are formed like sacks, with a small opening at the mouth, and each one has a slender and outward-curved appendage. If touched by an insect visitor the anthers would be shaken and the pollen scattered through the open end. The pollen is remarkably light and dusty for a bulbous plant, and may even be carried by the wind on dry days; but the design of hanging anthers with openings only at the lower end, and trigger-like appendages, points so clearly to preparation for insect agency in the dispersal of pollen that we may conclude the flowers are mostly fertilized by bees. These cling to the inner segments and insert their heads and thorax in search of honey, and are freely dusted with pollen while so doing, when the Snowdrop flower is fresh and expanded. It is easy to shake the anthers by touching the triggers with a pencil point and to see a cloud of pollen fall out.

Thus the pollination of the Snowdrop greatly resembles that of the widely different family of Heaths, in which we also find bell-shaped flowers with hanging anthers opening by pores and armed with triggers.

A very interesting problem is offered by the shape and colouring of the inner segments. As all know, they are generally shorter by one-third than the three outer ones, with a two-lobed instead of a pointed tip (apex), or, to express it in another way, they seem to have a piece cut out of the centre to form a notch (sinus). On their outer surface there is generally a patch of green colouring following the outline of this notch, but which is in some forms reduced to two separate spots on the lobes only. We can find a clue to the evolution of this very peculiar formation by comparing Snowdrops with their near relations the Snowflakes. In these the six segments of the flower are equal in size and similar in shape. Each ends in a distinct lobe or claw with a green spot just above the narrowing and folding that form that claw. If we imagine a further growth of the three outer segments and the elimination of this little terminal fold, we should get exactly the form of a Snowdrop's outer segment.

The green spot has disappeared, either from the expansion of tissues to form the extra size, or, as I think more likely, because it is no longer useful to the flower in guiding insects to the honey—in fact, it would be misleading in a widely expanded flower. On the other hand, the green marking is in all wild Snowdrops of normal construction intensified and specialized in the inner segments, and just round the most convenient place—that is, the sinus or notch—for the insect to insert its tongue.

The arrest of growth of the central claw of the inner segments, and the elongation of the sides into the two lobes, explain their shape, and such a development is just that required to extend the rounded green spot of a *Leucoium* into the horseshoe-shaped mark of a *Galanthus*.

The inner surfaces of these segments are usually marked with green lines on raised ridges between the veins. The honey is exuded from the base of these segments and flows a little way down between the ridges, so that the green lines and the ridges guide an insect visitor's tongue to the honey.

The large Snowdrop, *G. Elwesii*, from Asia Minor, appears to reach the high-water mark of specialization from the Leucoium type of flower. In it we find:

1. Larger and more boat-shaped outer segments.

2. Inner segments that overlap more, and are stiffer and more deeply furrowed, forming a closer bell, more like the tube of a Hyacinth flower in effect, and thus a still better protection for pollen than the more spreading, flatter segments of *G. nivalis.*

3. The triggers of the sprinkling apparatus of the anthers more curved and larger.

4. The presence of an additional green spot at the base of the inner segments. This may help to darken the cavity of the bell, but is so often joined by a central streak to the horseshoe marking that it may serve to guide insects down to the sinus.

Species and Varieties.

Galanthus nivalis. Figure 1 shows a fine tall form of the Common Snowdrop, with particularly well-shaped flowers, and twice as large in all its parts as the ordinary form. It was found in the garden of an old farm in Holland and introduced into English gardens in 1914 by the Haarlem firm of Van Tubergen under the name of *G. nivalis maximus.*

G. nivalis Melvillei (fig. 2) is a very beautiful seedling raised by Mr. Melville many years ago at Dunrobin Castle. I find it rather a dwarf form, but it is said to be taller than ordinary *nivalis* as it grows at Dunrobin. This drawing was made from specimens kindly sent me by Mr. Melville in 1906, and it has never grown any taller here. The globular form of the blossoms and their very slight green markings make it a very beautiful variety.

G. nivalis var. *poculiformis* is another of Mr. Melville's Dunrobin forms, but one which appears now and then among ordinary Snowdrops. The inner segments are similar to the outer in form and colour, and when fully expanded and just showing a gleam of the golden anthers among the pure white segments it has a very distinct effect. Unfortunately it is not a very stable form, and varies much in certain seasons, with inner segments of different lengths and more or less marked with green.

'Magnet' (fig. 4) is one of the late Mr. James Allen's beautiful seedlings. It is said to have been raised from seed of *Melvillei*, but is a much taller form, and chiefly remarkable for the very long and slender flower-stalk, which is so slender that the expanded blossoms sway to and fro in a breeze.

The tall and early-flowering form of the Snowdrop from Southern Italy is known as *G. Imperati*. The flowers figured (fig. 5) were grown in Canon ELLACOMBE'S wonderful garden at Bitton, where the long line of this fine variety under the south wall was always a beautiful sight in January.

There are several forms of *Imperati* in cultivation, but this one, which I believe was distributed originally by ATKINS of Painswick, and is called var. *Atkinsii*, is the finest of them. Tall, with a beautifully long bud and a large spot of light green and one of the earliest to flower, it is a very precious plant. A somewhat similar form was distributed by BACKHOUSE of York some years ago, but differs in a tiresome habit of seldom producing a perfectly formed flower. Either they have an extra segment, or one of the inner ones is longer than the others, or, again, a petaloid white bract may appear just below the ovary.

The large size of the green markings, and the slightly rolled edges of the young leaves, suggest that these large *Imperati* forms are of hybrid origin, and that *plicatus*, the Crimean Snowdrop, is one of their parents.

The Straffan Snowdrop, *G. caucasicus grandis*, is to my taste the most beautiful of all forms. The flowers are rounder and shorter, and, I think, better proportioned than in *Imperati*.

The drawing (fig. 6) was made from flowers sent to me for the purpose by Mr. BEDFORD, for many years the head gardener at Straffan, in County Kildare. There is a mystery as to the origin of this fine form. Mr. BEDFORD has lately said he believes it to be a seedling form. The late Mr. BURBIDGE greatly admired the plant as grown at Straffan, and considered it a form of *caucasicus*, brought by Lord CLARINA in 1856 from the valley of Tchernaya in the Crimea, among bulbs of *G. plicatus*. Anyway, Mr. BEDFORD was the first to notice it in 1858, when two flowers superior to their neighbours caught his eye.

All those now in existence were raised from that one bulb, and though it increases well by offsets it does not perfect seed. Notice the way in which each bulb, when strong, produces a second flower between the pair of leaves. This is very characteristic of the Crimean Snowdrops, and most of the seedling forms with *caucasicus* or *plicatus* in their parentage inherit this pleasing habit. Another virtue of this plant is that it comes into flower rather late, and when *Imperati* is over.

'Allen's Seedling' (fig. 7) is a particularly graceful form, considering the great size of the flower. It reminds one of 'Magnet' in the length of the flower-stalk; but the size of the green markings and slightly rolled edges of the leaves point to *plicatus* as one parent and *Melvillei* might be the other, from which the width of the outer segments has been derived. Such a beautiful plant as this should encourage others to raise seedlings from the best types available.

G. nivalis 'Galatea' (fig. 8) is another of Mr. ALLEN'S seedlings. In his paper on 'Snowdrops,' read at the Snowdrop Conference held by the R.H.S. (see JOURNAL R.H.S., vol. xiii. p. 174), he wrote:

"This too is one of the giants of the family as to size of flower,

but not in stature. I have never been able to decide whether this or 'Charmer' is the more perfect flower."

Unfortunately 'Charmer' seems to have been lost, and I have never been able to hear of it, and a rival to 'Galatea' would indeed be worth finding. This is the largest-flowered of the race of seedlings that are best classed as *nivalis* forms, and the flowers are of such good substance that they last in beauty longer than those of most forms. A strong bulb gives a second flower from its pair of leaves, and that and a slightly rolled edge to the leaf show the influence of *plicatus* somewhere in its pedigree.

Several forms of the Common Snowdrop have been found in Greece which flower in the autumn instead of the New Year, and send up their flowers before the leaves, or at any rate while they are only just appearing above ground. When the leaves of these five varieties are fully grown they are all noticeable for the pronounced contrast of a glaucous central stripe with the deep green of their sides. They are best regarded as forms of *nivalis*, and vary very slightly from one another, but retain certain characters of time of flowering and size of the green markings. That known as *Olgae* is generally the earliest to flower, coming up as soon as the late September rains moisten the ground. It was found by the botanist ORPHANIDES on Mount Taÿgetus. The green is very pale in an old blossom, and fades out entirely if such a one be dried. This has resulted in its being described as without green markings.

The form known as *Rachelae* is the handsomest and most robust of these autumnal forms. It flowers in mid-October. When Professor MAHAFFY, of Trinity College, Dublin, was in Greece, he collected a few bulbs at random to send to his friend Mr. BURBIDGE. Among them was a solitary bulb of this Snowdrop collected in 1884 on Mount Hymettus. The few that now exist in our gardens are all descendants of this one bulb. It and another variety known as *G. Elsae*, found on Mount Athos, were named after Professor MAHAFFY'S two daughters.

Green Snowdrops are perhaps more interesting than beautiful. They seem to be reversions to ancestral forms with Leucoium-like green spots near the tips of the outer segments, and forms with tendencies to these green markings have been found in all four of the distinct races of Snowdrops.

The earliest found and best known of them is a form of *nivalis* called *Scharlokii*. It was found by Herr JULIUS SCHARLOK in 1868 in the valley of the Nahe, a tributary of the Rhine. In figure 9 you will notice that, besides the extra green markings, it is very remarkable in having the two leaves that form the spathe free and distinct instead of joined together by membrane as in other Snowdrops. This also may be an ancestral form, and is not very constant, as in some seasons many flowers appear with the spathes united for half or more of their length.

A somewhat similar variety appeared among the large form sent

FIG. 1.—GALANTHUS NIVALIS MAXIMUS.
2/5 nat. size.

[*To face p.* 32.

FIG. 2.—GALANTHUS NIVALIS MELVILLEI.
2/3 nat. size.

FIG. 3.—GALANTHUS NIVALIS POCULIFORMIS.
Nat. size.

FIG. 4.—GALANTHUS NIVALIS MELVILLEI 'MAGNET.'
1/2 nat. size.

FIG. 5.—GALANTHUS IMPERATI.
2/5 nat. size.

FIG. 6.—GALANTHUS 'STRAFFAN' SEEDLING.
2/5 nat. size.

FIG. 7.—GALANTHUS NIVALIS 'ALLEN'S SEEDLING.'
3/5 nat. size.

FIG. 8.—GALANTHUS NIVALIS 'GALATEA.'
1/2 nat. size.

FIG. 9.—GALANTHUS NIVALIS SCHARLOKII.
2/3 nat. size.

FIG. 10.—GALANTHUS PLICATUS MAXIMUS.
1/2 nat. size.

FIG. 11.—GALANTHUS LATIFOLIUS.
1/2 nat. size.

FIG. 12.—GALANTHUS ALLENII.
2/5 nat. size.

FIG. 13.—GALANTHUS FOSTERI.
1/2 nat. size.

FIG. 14.—GALANTHUS ELWESII, GREEN-SPOTTED FORMS.
1/2 nat. size.

FIG. 15.—GALANTHUS ELWESII, UNSPOTTED FORMS.
2/5 nat. size.

FIG. 16.—GALANTHUS BYZANTINUS.
1/2 nat. size.

[To face p. 33.

out by Mr. VAN TUBERGEN, and this too has curious spathes, larger and less united than in the white form.

A very curious plant, in which the inner segments are all green except for a narrow white edge, and the outer ones striped for the greater part of their length with a greyish-green, was introduced through Herr MAX LEICHTLIN, of Baden, and has been traced to the Vienna Botanic Gardens, but no farther. It is a dwarf, late-flowering form, known as *G. caucasicus virescens*, but has no resemblance to other forms of *caucasicus*, and never, so far as I have seen, produces a second flower in the pair of leaves as a *caucasicus* form should.

There is also a very curious double flower that does not droop, and has all its alternating rows of inner and outer segments deeply tinged with green. It appeared suddenly in a Scotch garden where no other Snowdrops than the ordinary *nivalis* had been grown.

Yellow Snowdrops do not perhaps sound beautiful, but when seen in the sunshine of a fine February morning a clump of either of the yellow forms is very striking. In the var. *lutescens* the ovary and the ordinarily green markings are of a bright yellow. Two distinct forms with these golden markings have been found in Northumberland, and have travelled thence into many good gardens.

Last year Mr. CLARENCE ELLIOTT sent me a flower of a form new to me, in which the segments themselves are tinged and striped with yellow. It was rather a faded and crumpled flower, but a fresh one might well be an attractive addition to the yellow forms.

In a Cheshire garden there appeared a form of double Snowdrop with a green ovary but the markings of the inner segments bright yellow. This is a very charming flower, and though in the first season, after they have been replanted, some will have green markings, it is fairly constant when undisturbed and has a very bright effect when fully open.

The last *nivalis* form needing mention is a double one raised by Mr. ALLEN, and called by him 'Charmer' *flore pleno*. It differs from the ordinary double in having only three of its handsome, large outer segments, and the centre filled up with whorls of the green-striped inner segments only, thus producing a very neat and regular flower, like a double Ranunculus.

Thus far we have been concerned with forms that are best grouped under *G. nivalis*, the Common Snowdrop. Now we pass to the second group, *G. plicatus*—so named because its leaves are plicate, that is to say, folded back or pleated at their edges, at their first appearance above ground. The leaf characters offer the most useful means of dividing the known Snowdrops into four groups.

Thus we have the *nivalis* group, with narrow almost flat leaves, more or less glaucous, that is, blue-grey, on their upper face.

Then *plicatus*, with broad deep green-leaves folded at their edges. *G. plicatus* is found in the Crimea and Dobrudscha, and is generally called the Crimean Snowdrop. When the snow melted away from the trenches in which our soldiers passed the bitter winter of the Crimean

War, great numbers of this Snowdrop flowered and whitened them again; and several forms of it came to our gardens straight from those trenches.

Like *nivalis* it varies a great deal. The form called *G. plicatus maximus* (fig. 10) is perhaps the finest of all, but will not grow happily in every garden.

It has a yellow variety, which has been grown for many years in the Cambridge Botanic Garden, and came to me from thence; and there is also one which in some seasons has green markings on the outer segments and in which the inner segments are almost entirely green, and this year a double form has appeared in an Irish garden.

The third group is distinguished by its leaves being wide, without folds, and of a peculiarly shining bright green, and generally arching outwards in graceful curves.

The Caucasian species, *G. latifolius*, was the first known of this group, and the others seem to be only geographical forms of it, or possibly hybrids.

G. latifolius itself is shown in fig. 11, and it will be seen that its flowers are rather small and colourless, and do not come up to the promise of its handsome leaves.

In 1883 Mr. ALLEN received some bulbs of *latifolius* from an Austrian nurseryman, Herr GUSMUS, and among them was one altogether superior to the rest. This has since been named *G. Allenii*, in honour of its introducer. Fig. 12 shows what a well-grown specimen of it can do when it has arrived at its full growth. Fortunately this treasure has a good constitution, and has passed from Mr. ALLEN'S garden at Shepton Mallet into many others.

Several intermediate forms are in cultivation between the typical *latifolius* and the best form of *Allenii*. A seedling form I noticed at Bitton, and was allowed to carry away with me, is probably a hybrid between *Ikariae* and *Imperati*, and is most like the former, but differs in having rather longer and narrower leaves and in flowering a fortnight before it.

The true *Ikariae* is only found on the Island of Nikaria, off the coast of Asia Minor. It is one of the latest of all to flower, and the large flowers are very richly marked with green, and its leaves bend outwards more than in any other form.

Fig. 13 shows *G. Fosteri*, which is thought to be a hybrid between *latifolius* and *Elwesii*, as having the wide shining leaves of the former and the flower of the latter. Also the leaves differ in many specimens from *latifolius* in being deeply concave on their upper surface, which, as we shall see, is one of the features of *G. Elwesii*.

It was introduced by Sir MICHAEL FOSTER from Amasia, in North Central Asia Minor, but has not proved as fine a garden plant as it promised to be. MAX LEICHTLIN called it 'The King of Snowdrops,' and Sir MICHAEL FOSTER praised it highly; but I have never seen a finer specimen of it than the one the figure was drawn from, and I think it a badly proportioned flower, and find it a bad grower.

The fourth group contains *G. Elwesii* and its many varieties. They come from Asia Minor, and are for the most part handsome and large. The leaves are more uniformly glaucous than in other Snowdrops, and are generally very wide and concave on their upper surface, but vary enormously. So also do the flowers, but they almost always show a second large patch of green at the base of the inner segments. This may be joined to the horseshoe-marking by a narrow central line, or in some varieties almost covers up the whole of the inner segment. Some abnormal forms have green spots on the outer segments (fig. 14), and some (fig. 15) are without the second green spot. I have seen only two in which it is missing, though I have heard of another in Mr. Boyd's garden.

Many people complain of the difficulty they find in growing *G. Elwesii*, and that it dies out after a year or two. In other gardens it increases fairly well from offsets, and rapidly from self-sown seed. With me it likes a fairly open situation, so that it may get well ripened in summer. It has died out when planted under shrubs, but has seeded and increased well in a rather dry peat-bed planted among dwarf Heaths, and I believe is going to do well in a bed of Ivy under a Deodar, a very hot and dry position. In some steep and well-drained banks of the rock-garden it has also increased well.

It has been very largely collected of late years—before the war, of course—and among collected bulbs, early and late, dwarf and tall, round and long-flowered, and many types of variation can be found.

It hybridizes easily with other species, and the seedlings are as a rule vigorous and handsome. One of Mr. Allen's seedlings, called by him 'Robin Hood,' is *Elwesii* × *plicatus*, and though it shows but little of the folded leaf of *plicatus*, yet the characters of both parents may be seen in the foliage and even more clearly in the flowers, which have the large, rounded outer segments of *Elwesii*, while the inner ones have the deep green of *plicatus* and the additional amount of it of *Elwesii*.

Mr. Elwes gave me a very curious Snowdrop he found at Colesborne among groups of *G. Elwesii*. When first the flowers open they are on such short stems that they are hardly lifted above the ground. Later on they grow taller, and strong bulbs throw up a second flower. The leaves spread outwards in a very marked manner, and the ovary is peculiarly long and narrow for any Snowdrop of *Elwesii* relationship. I think it must be a hybrid, and suggest that it has been produced by a cross of *Elwesii* and *caucasicus*.

G. byzantinus (fig. 16) is supposed to be a natural hybrid between *Elwesii* and *plicatus*. It was introduced in 1893, and has since been largely collected near Broussa. It has the wide folded foliage of *plicatus*, but of a lighter and more glaucous green, while the flowers are similar to those of *Elwesii*, and very variable in their markings and shape. It is a beautiful garden plant, as where it does well it is one of the earliest of those that follow the autumnal forms. It generally appears above ground here in November, and bears many

blossoms in December, and is at its best about the first week of January if the weather is mild, but keeps up a succession of flowers till the end of the month. It increases well by offsets and sows itself.

Mrs. R. O. Backhouse, of Sutton Court, Hereford, crossed *nivalis* with *plicatus* and obtained a very beautiful strain of large-flowered forms, which Mr. Baker has named *grandiflorus*. Unfortunately they are not long-lived, and die out after a year or two, or they would be among the finest of Snowdrops.

We have seen a few of the many varieties of this favourite flower, which will give you some idea of what has been done by collectors and seed-raisers. I feel sure much more might yet be done to add other forms to our gardens. It is quite likely that many autumnal or winter-flowering forms could be found in Greece, and that, if we all saved and sowed at once the seed produced in our gardens, greater vigour and perhaps still greater beauty might be found among the seedlings.

Cultivation.

The main point to insist upon in growing Snowdrops is to keep them out of the ground for as short a time as possible.

If transplanting them in one's own garden, the best time is when they are in full flower, provided that in digging them up none of the roots are broken, that they are not allowed to get at all dried before replanting, and that the roots are spread out in as natural a position as possible in their new situation. When buying bulbs they should be ordered early, so that they may be delivered in July or August, and certainly not later than September, and they should be planted as soon as possible after their arrival.

Most kinds like a cool but well-drained soil, and seem happier when growing among the roots of deciduous shrubs, but I have seen *nivalis* very happy in a low-lying bit of ground often flooded in winter; and *Elwesii*, as I have said before, certainly in this garden prefers a warm dry bed, where the sun can warm the bulbs and ripen them.

Atkins' form of *Imperati* also appreciates warmth, and is never better than at the foot of a south wall, as it grew so finely at Bitton.

DELPHINIUMS.

By Amos Perry, F.R.H.S.

[Read June 5, 1917; Mr. W. A. Bilney, J.P., in the Chair.]

Delphiniums are among the most popular of plants for general border decoration. They are quite hardy, quickly establish themselves in any well-cultivated sunny border, and no garden can be considered complete without a representative collection.

Many species both annual and perennial are well known in cultivation, the most popular being the stately hybrid perennial Larkspur, valuable on account of their variable heights and wonderful range of colours.

The old strains of Delphiniums have been improved almost out of recognition. Compare, for instance, the narrow-petalled flowers, crowded together, which you found in the varieties popular twenty years ago, with a well-developed spike of 'King of Delphiniums.' This has been the work of years of careful selection. Their popularity has given the nurseryman and the amateur sufficient encouragement to experiment in the raising of new and improved forms, and we owe a great debt of gratitude to the houses of Kelway and V. Lemoine for their work in this direction. Many of the sterling varieties now common in our gardens came first from Langport and Nancy.

Cultivation.—Although the hybrid perennial Larkspur is of very easy cultivation, the finest results will be obtained only when special attention is given to their requirements. Where the soil is heavy and saturated during the winter months, and parched during the summer, the borders should be deeply dug or trenched during the early autumn, and well-decayed manure incorporated, and allowed to remain fallow during the winter months, planting early the following spring. On the other hand, should the soil be loose or sandy the borders should be deeply dug, arranging for a copious supply of manure to be placed at the bottom of the trench to encourage deep rooting, and planted during early autumn. As a precautionary measure I would recommend a mulching of manure during the summer months and an abundant supply of water during very dry weather, especially in the period prior to flowering.

It is a very common practice to cut Delphiniums down immediately the first flush of beauty is over, when a further display may be looked for during August and September, but then the plant has a tendency to make numerous crowns, and the following season you will have to pay the penalty by having a number of small spikes and not such a good display as might be expected from established

plants. I strongly recommend you, especially those who are wanting spikes for exhibition purposes, to allow the plant to ripen a small portion of its seed. If, however, specimen spikes are not wanted, the plant can be cut down immediately after flowering. It will then be necessary to give a liberal dressing of well-rotted manure and an occasional watering with manure water.

During the winter months Delphiniums are often attacked by slugs, with most disastrous results. As a precautionary measure carefully remove the soil from the crowns and cover with 2 or 3 inches of very fine ashes. This I have always found most effective, and certainly more reliable than the many patent remedies now on the market. I also recommend the plants to be divided and transplanted every third or fourth year.

There are several methods of propagating—divisions, layers, cuttings, and seed. The most popular method of increasing stock is by division; this should be done during March. The practice I annually adopt is to lift my plants towards the end of February or in early March, when the stock is quite dormant, and place in a cold frame. Immediately they have started into growth they are again lifted and divided, cutting away as much of the old root as possible, leaving two or three crowns to each division. They are then laid back in the frame for another three or four weeks, kept close for a week or two, and are then quite ready for planting in their permanent quarters. Care should be taken to select favourable weather for this operation, and, above all, do not let the young stock suffer from drought.

The best time for taking cuttings is during the early spring. Carefully remove the soil from the parent plant and take the young shoots about 3 or 4 inches high, selecting the weak spikes, taking the utmost care that a little of the old plant adheres to the young cutting. Place in a cold frame in sandy loam, keeping closed for a week or ten days, and after that period give air daily. When they are rooted they should be transplanted or potted, ready for planting the following autumn or spring. Cuttings may also be taken during late summer and autumn from plants that have been cut back for a second crop of flowers. Select non-flowering spikes, securing as much as possible of the mother plant; insert in sandy loam in a closed frame. I cannot recommend this method, as I find on my wet and heavy soil losses have been very severe, and I only revert to this unsatisfactory method when I have been unsuccessful with some particular stock during the spring.

I have raised large stocks of many of the finer varieties by layering, and can with every confidence recommend this method of increasing stock. I usually start layering towards the end of May and through June. It is necessary to make a neat cut at the extreme base of the stem, well covering the cut with fibrous loam, carefully securing the stem to a centre stake to hold it upright. Leave the layers on the mother plant until the following spring; in this way I usually secure good stocks of healthy youngsters. Occasionally I have been com-

pelled to move the layers during the early autumn, but always with disappointing results.

Sowing seed is a very simple and interesting method of raising stock. Sown in a cold frame immediately the seed is ripe, the plants will flower well the following summer. Care must be taken of the seedlings during the winter months, and on no account must they be coddled. They should be kept moderately dry, with plenty of air, and on favourable occasions remove the lights and do all that is possible, so as not to encourage early growth. Transplant into their permanent positions early in March, providing the weather is favourable.

Great care should be taken in selecting the varieties for seed, choosing only those of clear, distinct colours, robust habit, and symmetrical well-set spikes.

Quite a number of the distinct types will come remarkably true from seed. *Delphinium* 'Rev. E. Lascelles' is capable of producing a very high percentage of large circular flowers, with its characteristic spreading centre. 'King of Delphiniums' has produced a very encouraging percentage true to type. 'Geneva,' one of the most popular light-blue bedding varieties, has produced in my garden quite 50 per cent. absolutely true to type and colour. Of course the seedlings are a little more vigorous, but after they have had one or two years' propagating it is impossible to distinguish them from true 'Geneva.'

I trust these few remarks will not lead you to assume that the general collection of hybrids can be raised true from seeds.

During the last twenty years I have specialized in this family, and I have records of over 500 named varieties that have been grown in my Winchmore Hill and Enfield gardens for trial purposes. These were secured from reliable sources both at home and abroad, and at least 400 of this collection have been found wanting in some respect.

The majority of the flower-loving public desire in Delphiniums vigorous constitution, clear self colours, and symmetrical well-set spikes. The following twelve varieties are, in my opinion, the finest yet introduced, and in arriving at this judgment I have been somewhat led by an analysis of my order sheets.

Introduced about twenty-five years ago, 'King of Delphiniums' is still one of the most popular. I have for some years past been making large shipments of twelve to fifteen thousand plants of this popular variety for overseas trade.

'Statuaire Rude,' gigantic spikes, immense flowers of a delightful shade of heliotrope blue.

'Table Ronde,' immense circular flowers, delightful shade of reddish plum.

'Henri Moissan,' immense flowers, rich purplish blue.

'Cory,' a Continental variety of great merit, exquisite shade of forget-me-not blue.

'Nellie,' another variety of Continental origin, enormous spikes,

large circular flowers, rich shade of clear sky-blue with bold white centres.

'Duke of Connaught,' immense spikes, rich gentian-blue, bold white centre.

'Queen Mary,' large circular flowers, striking shade of rich azure-blue with conspicuous white centres.

'Rev. E. Lascelles.' This variety has gained great popularity partly on account of its dwarf habit, well-set spikes, large circular flowers, rich blue with a striking white centre.

'La France.' One of the most distinct that has come under my notice, and when established producing branching spikes 2 to 3 feet across, flowers soft lavender and sky-blue.

'Moerheimi,' the first and only pure white variety that has come under my notice. This is a plant of great merit, and when associated with the blue varieties is very effective for bedding and border decoration.

'Bella Donna,' an old and popular favourite, whose origin is veiled in obscurity. For bedding purposes this and its varieties are unique, growing 2½ to 3 feet, and flowering throughout the whole summer. Mr. G. GIBSON of Bedale was the first to raise seedlings from it in his garden during the summer of 1899, and many varieties are now in cultivation superior in colour and constitution. The finest are 'Mrs. Brunton,' 'Mrs. Thompson,' 'Grandiflora,' and 'Mrs. G. Gibson.'

Notwithstanding the great popularity of this interesting family, hybridists have not yet interested themselves, consequently hybrids are practically unknown. During 1914 an interesting series was raised and distributed by V. LEMOINE of Nancy by crossing *Delphinium elatum* and *D. tatsiense,* a Chinese species of recent introduction. These pretty hybrids will command attention when better known. They are remarkably free-flowering, and admirably adapted for bedding and cutting purposes.

Among the species now in cultivation, *D. cardinale* is without a doubt one of the most handsome, revelling in a moist, well-drained sandy soil, and when established growing 6 feet high, with branching stems smothered with brilliant orange-scarlet coloured flowers.

Another charming species is *D. Zalil,* introduced from Afghanistan about 1887, and extensively used in Persia for dyeing silks. I have been most successful with this plant, growing it 5 to 6 feet high in stiff, heavy loam in the driest part of my garden. The whole forms a neat feathery bush smothered with pale-yellow flowers.

D. formosum is extensively grown by our market men for cutting purposes. It has a neat habit and attractive olive-green foliage, with somewhat flat heads of rich purple flowers.

D. cashmirianum, a species of great merit, neat symmetrical bushes covered with soft blue flowers—a very pretty subject for the rockery.

D. nudicaule is a dwarf Californian species growing about 15 inches high, revelling in a sunny position in the rockery or border, neat

twiggy habit, covered with dazzling scarlet flowers. There are several varieties of this pretty species. One of the best known is *aurantiacum* with orange-yellow flowers, and *D. nudicaule purpureum* with flowers of a delightful shade of deep rose-purple. The entire stock of this new variety is in the hands of a Continental nurseryman and not yet distributed.

D. grandiflorum and its varieties are immensely popular, and justly so, and if given a congenial spot and a little attention are objects of the greatest beauty. They are easily grown in any well-drained spot, taking care always that they have a copious supply of water during the very dry weather. They form neat bushes of attractive foliage smothered with large well-formed flowers, pretty shades of gentian-blue, sky-blue, plum, and purest white, both singles and doubles, all growing under 18 inches and most easily raised from seed. If sown in their permanent quarters and carefully thinned out, will flower the first year.

I am working up a large stock of a very remarkable break that occurred in my garden during 1914. This variety when established will grow 3½ to 4 feet high, and branching in a way that reminds one of *Delphinium* 'Persimmon,' but with the characteristic root stock of *Delphinium grandiflorum.*

D. Nuttalli, a handsome North American tuberous-rooted species, well worth cultivating on the rockery or any well-selected spot in the border, growing about 18 inches high, with neat branching spikes of pure white flowers having a conspicuous blue blotch on the upper segment.

D. vestitum is not well known in the garden, but is a distinct and handsome species from the Himalaya. The flowers are somewhat small, but of such a deep purple-blue that, together with their black stems and centres, they make a striking feature towering up amongst the other herbaceous plants. It is also valuable because it flowers later than the florist's varieties.

D. trolliifolium should be grown for the sake of its glossy handsome leaves and rich blue flowers, produced in great profusion at the end of May and before many of the family are in bloom.

D. elatum, from the Alps of Central Europe, is not very showy, as too often the flowers are of a slaty blue.

Many interesting species have been introduced lately from China. Mr. George Forrest, writing in the *Gardeners' Chronicle* on September 9, 1916, states that the higher Alps of North-Western Yunnan towards the Tibetan frontier are the homes of many beautiful species ranging from 4 inches to 6 feet, and their colour range is very great, from the palest blue to deep rich purple, and in some species white. However, the gems that are most likely to prove of the greatest horticultural value are amongst those of the lesser stature.

One of the most attractive that has come under my notice is *D. likiangense*. This beautiful Alpine species is now well established in the famous Botanic Gardens, Edinburgh, growing 12 inches to 15 inches high, and forming symmetrical tufts of finely divided glossy green

leaves and numerous erect stems, terminating with three to five flowers, of a pleasing shade of soft light blue.

D. Pylzowi is another beautiful species with large deep-blue flowers on slender stems, and so dwarf in habit as to associate with some of the choicest of the rock-garden plants.

Annual Larkspurs.—In these hardy annuals we have a great wealth of beauty and an unusually wide range of colour. They are also very varied in their habits. Their cultivation is simplicity itself. They can be sown any time after February. They can also be sown during September and October, but if autumn sowing is adopted care should be taken to protect the seedlings from slugs &c., and this can easily be achieved by covering the seed patch with fine ashes.

I do not advocate transplanting. I find they do very much better if sown in their permanent quarters and carefully thinned out when the plants are large enough to handle. They are not at all fastidious as to soil or situation. They will thrive in the driest possible position, and charming effects can be cheaply produced by judicious planting of these charming annuals, grouped between shrubs, in the herbaceous borders, or even on the rockery. They are at their best during July and August.

The species that have given rise to these attractive annuals are *D. Ajacis* and *D. consolida.*

The rocket Larkspur, *D. Ajacis,* is the most varied, and has been arranged in three groups. The tall rocket Larkspur, *D. Ajacis major,* has stout well-arranged spikes growing 3 to 4 feet high, bearing myriads of single and double flowers, white, pink, rose, violet, blue and intermediate shades, and is the best variety for general border decoration. The dwarf rocket Larkspur, *D. Ajacis minus,* is particularly neat in appearance, growing 18 to 24 inches high, has well-set spikes of double flowers ranging from white to deep rose, and is admirably adapted for planting in the front rows of the border. The Hyacinth-flowered Larkspur, *D. Ajacis hyacinthiflorum,* is admirably adapted for pot cultivation, has a dwarf sturdy habit pretty tapering spikes of clear-coloured flowers, in general appearance reminding one of a well-grown hyacinth.

D. consolida, the branching Larkspur, is quite distinct from the preceding and equally as valuable from a gardening point of view, seeing that it is later, considerably prolonging the flowering season, with tall branching stems, smothered with medium-sized flowers, in richest shades of violet, purple, white, and pink.

D. consolida imperialis, or 'Emperor' Larkspur, is particularly valuable on account of its dwarf habit, forming neat symmetrical bushes 18 to 20 inches high, 2½ to 3 feet in circumference, covered with full double flowers for a considerable period.

BORDER CARNATIONS.

By J. Douglas, F.R.H.S.

[Read June 19, 1917; Sir J. T. D. Llewelyn, Bart., V.M.H., in the Chair.]

Many people fail to appreciate the capabilities of the true Hardy Border Carnation, because of imperfect knowledge of its cultivation, or on account of confusion of mind resulting from reading articles in praise or dispraise of the Perpetual Flowering Carnation as a border flower.

The two types are very far apart, and I do not propose to make comparisons between them, but simply state that I cannot recommend the Perpetual-Flowering Carnation as a border plant for an amateur grower, though I believe there are some who are able to do so. I leave the comparison to the beginner to ascertain by experience. My own experience is that the ordinary American Tree Carnation cannot stand against our damp cold winters. It is with the Border Carnation proper that I propose to deal in this paper.

It always seems to me that many people give themselves a vast amount of trouble layering Carnations and wintering them in cold frames, when far better results can be obtained by allowing the plants to remain undisturbed for a few years. The Hardy Border Carnation is a true perennial, and should be grown as such. When the object is a display of flowers, then by all means allow the plants to stay in the same place for at least three years, mulching them every summer with horse manure. This treatment keeps the roots cool and moist in dry weather, and at the same time acts as a valuable stimulant. It is a fact, however, that the largest and most suitable blooms for exhibition are obtained from one-year-old layers; but the display they produce is not to be compared with that of the two- or three-year-old plants. I have often seen as many as 400 blooms on one of these three-year-old plants, which frequently measure three feet across. A few years ago it was considered the right thing to layer every plant in the garden, starting the following season with young rooted layers transplanted and arranged, sometimes in nice symmetrical rows, according to a well-thought-out colour scheme carefully planned beforehand. I am not ashamed to say that I learnt wisdom from one of our garden labourers, to whom I had given a few surplus plants to adorn his cottage garden. These were planted in a small patch of ground in the front of his house and left there for five years undisturbed. At the end of three years they had become huge healthy clumps, bearing from 350 to 400 flowers. Another very good way of assuring an abundant supply of bloom is to peg down, or rather layer, the side growths around the old plant, allowing them to bloom and remain undisturbed and

unseparated from the parent plant. This is a very good way indeed, for it prevents the leggy appearance sometimes noticed in the older plants, and always assures a nice compact clump.

Great improvements have been made by hybridization within my own experience, which extends over the last twenty-five years.

In the year 1889 it appeared certain that, if the Border Carnation was to become a garden favourite, easily cultivated and enjoyed by the small amateur as well as by the professional gardener, something must be done to improve its physique, whilst carefully preserving the wonderful form of the flower, which in the past had always distinguished this aristocrat of the Dianthus family.

The worst fault appeared to be the inherent weakness of the stem, causing the flowers to flop over—even in varieties having small blooms—unless they were carefully staked, displaying also what is technically termed a weak neck.

Another fault equal in degree to the last was an almost total absence of scent. 'Raby Castle' and the 'Old Clove' were two of a number that could be counted on the fingers of one hand, having any pretension to a clove scent. Again, the range of colour was limited; 'Mrs. Reynolds Hole' was the only apricot self worthy of the name, and in yellows, 'Germania,' a German variety raised by BENARY of Erfurt, was alone. Both these varieties, most pleasing in colour and of exquisite form, the latter having the appearance of a yellow Gardenia, were more than difficult in the border, and, to be frank, were without a real constitution, both needing careful growing and wintering in a greenhouse or frame.

About this time, however, the late MARTIN R. SMITH of Hayes and my father, the late JAMES DOUGLAS, of Great Bookham, determined to evolve a useful race of Hardy Border Carnations, neither being satisfied with the English varieties available in the year 1889. A complete change of blood seemed to suggest itself as the only solution. Both were enthusiastic florists and men of great determination. They therefore set out together on a tour through Germany, France, and Holland in search of varieties suitable for crossing with the standard English varieties then in cultivation. The nursery of ERNST BENARY of Erfurt provided about two dozen varieties thought to be distinct and favourable for the purpose. And how very German were the names and how bizarre the colour of that little collection!

'Brockhaus'; buff flaked slaty grey.

'Julius Bassermann'; yellow striped scarlet and purple.

'Parsifal'; buff streaked red and orange.

With these two dozen German varieties, and one or two picked up in Holland, the two enthusiasts set to work, and very soon several hundred grand varieties were produced, many of them being standard to-day, such as 'Cecilia' sent out by DOUGLAS in 1899, but raised by MARTIN R. SMITH; 'Liberté,' 'Miss Willmott,' and 'Elizabeth Shiffner' raised by J. DOUGLAS, and the fine old clove-scented 'Lady Hermione' raised by MARTIN R. SMITH. Many Fellows of this

Society will remember the wonderful exhibits of these gentlemen between the years 1899 and 1909. Yet even at this time, a fine-petalled flower was sure to find a place with the chosen few from the seedling bed, without too many questions being asked as to its other qualifications to rank as a Hardy Border Carnation. So that, although the race had been immensely improved in constitution and the highest standard of form established, an ideal border habit was not generally characteristic of them; for, although it is good to produce magnificently formed flowers that can win in strong competition, there is much else essential to the Border Carnation. My own views of what an ideal Border Carnation should be are as follow:

First, and all-important, is the stem that bears the flower. This should be perfectly rigid and capable of bearing the flowers erect without the necessity of using stakes; the bloom itself should possess a sound long calyx not overcrowded with petals, for it must be remembered that the flower will be exposed to rain, and buds crowded with petals often rot ere they can expand, owing to the wet. Of course the calyx should be strong enough to enclose and sustain the petals without bursting.

Secondly, all Border Carnations should be sweetly scented, and if possible, clove-scented. We are making this a great point now, and have already Cloves in every shade except yellow. I have never yet seen a yellow Carnation that possessed a scent, even in a faint degree. The following varieties are of the strongest Clove scent and represent a few of the best and most popular kinds:

'My Clove' (shell pink); 'Bookham Clove' (real old Clove colour); 'Ellen Douglas' (silver grey or lavender); 'Surrey Clove' (maroon); 'Mrs. Andrew Brotherstone' (fancy); 'Distinction' (fancy); 'Lady Hermione' (a fine old salmon variety).

'Bookham Clove' is quite the strongest Clove-scented Carnation I have ever seen, and it owes its existence to a mild challenge thrown out by a colonial lady who came to England on a visit. She asked me one day what had become of the real old Clove of her girlhood days, asserting emphatically that most of the so-called 'Old Cloves' were different in colour and not the true Clove of fifty years ago; adding that the Edenside collection held no such gem as the 'Old Clove' of her father's Herefordshire garden, and that this genuine 'Old Clove' had a scent distinct from any other Carnation or any other so-called Clove that she had seen on her last visit to the old country. Nearly a year after I had an opportunity of acquiring two plants from a stock that had been carefully preserved in this old Herefordshire garden for sixty years. I was rather surprised to find my lady visitor's account perfectly true in every respect. The bloom from these two plants, instead of being the dull maroon peculiar to the Clove one finds in the cottage gardens of Surrey, was of a beautiful dark crimson-purple showing a glow of almost a wine shade, but the scent of those blooms was perfectly wonderful, the two blooms strongly perfuming a dining-room 22 feet by 18. Strange to say, the Clove perfume was

more apparent from a distance of 10 feet than when held close to the nose. The bloom, however, was small and the calyx was burst, yet there was the glorious scent and the strange, fascinating, wine-like colour. I thought of the lady's challenge, and there and then resolved to raise a Clove to beat it. That was ten years ago. The road was paved with many difficulties and disappointments, yet at last, after many failures, 'Bookham Clove' appeared on the seedling bed, its colour the precise shade of the genuine 'Old Clove,' but what an advance in every other respect! Its blooms were held erect on wire-like stems, its calyx was absolutely sound, and, I almost hesitate to assert, the flower was more powerfully perfumed. Yet that was the verdict of several members of the Floral Committee who gave this variety an Award of Merit in July 1914.

The third and last characteristic essential is a full flowering period, and I would here observe that the term perpetual, as applied to Border Carnation, is quite misleading. The meaning of the word, as there is no need to point out, is continuing for ever, or without ceasing. That always seems absurd to me, especially when one recalls the English spring, autumn, and winter. Of course, the blooming period in the south is longer than in the midlands and the north, but under the most favourable conditions the months in which bloom can be obtained from Carnations outdoors are June, July, August, and, in some years, part of September. Of course, all sorts of cases can be cited when bloom can be cut earlier or later, but, strictly speaking, the three months mentioned are the extent of the blooming period. Ten years ago I made some very thorough and expensive experiments, crossing the best Border Carnations with the best Tree Carnations and vice versa, in some years blooming as many as 5,000 seedlings. These, of course, were wintered in beds outside, and one particular bed I remember in the winter of 1909 consisted of 2,000 plants, and splendid bushy youngsters they were. Although we had a mild winter we had a lot of rain, and every plant collapsed after a sharp spring frost. I have never seen a bed of Hardy Border Carnations affected in this way. The following winter being dry, more than half survived of a bed of 3,000 plants, one only, 'Hercules,' being considered worthy of notice, a fine bold maroon self, lacking the incomparable form and petal of a good Border Carnation, yet a strong hardy and tried variety in the border. 'Hercules' was awarded a unanimous Award of Merit by the Floral Committee of this Society in June 1911. Its habit is as perpetual as the English seasons will allow, and I have seen blooms of this variety in May and in September. It winters well as far north as Aberdeen. However, regarding the matter from all points, it was considered advisable to discontinue the cross-fertilization of the two types, especially as the Tree or Perpetual Carnation imparted to the hybrids a far greater height than is desirable in a Border Carnation, and as a rule the clear-cut edge and incomparable form of the Border Carnation were entirely destroyed.

We had noticed that amongst the standard varieties of Border

Carnations there were several that invariably gave a second crop of bloom in the autumn. These were carefully cross-fertilized and seedlings again selected with the same habit, and thus, by careful selection, we have gained the full flowering period permitted by our English seasons.

Some time ago I received a letter from Miss KINGSFORD of Fulham, a well-known writer to the gardening papers on Border Carnations, and collaborator with Mr. H. H. THOMAS in the production of that useful little work "The Carnation Book." In her garden at Fulham she had a plant of the Salmon Carnation, 'Mrs. R. Gordon,' bearing 342 blossoms. This extreme floriferousness, of course, does not continue all the blooming period, but rarely can one visit a plant of this variety without finding bloom on it between the months of June and September.

These remarks indicate clearly enough that the Carnation is quite an easy, free-growing border plant. There is no closely guarded secret known only to experts and unattainable by the ordinary amateur; but, of course, on the other hand there is no royal road, paved with indolence and ease, that will lead to success without some little exertion and the intelligent knowledge of the simple wants and requirements of the plant.

I now propose to give a few short hints on the general cultivation of the Border Carnation, and, in dealing with the two extremes of soil, heavy and light, I always find that the value of a stiff clay soil is greatly enhanced by the addition of a lightening medium, such as horse manure and coarse road sand or mortar rubbish; whilst the light loams and chalky soils are benefited by incorporating ordinary farmyard manure. I have seen Carnations growing to a remarkable degree of perfection in stiff clay and in light calcareous soil. I have seen them grown with success on walls where little soil of any kind was visible. Altogether I consider the Border Carnation one of the most adaptable of plants in respect of environment and soil conditions.

Carnations are very easily raised from seed, and this is an excellent method where an abundance of bloom is the main requirement, though, if extra fine flowers are wanted a stock of plants propagated as layers from named varieties must be procured, and these in turn can be layered by the grower for the purpose of increasing his stock. If seed is purchased from a really good source, the resulting plants will give 80 per cent. to 90 per cent. of double flowers, and a few of these may be little if at all inferior to many named varieties. The seed may be sown any time during March or April, or, if the season is backward, it will not be too late if done early in May. As soon as the young plants have formed the second rough leaf, say about three or four weeks after germination, they should be pricked out of the seed boxes or pans, and planted out in prepared beds where, by September, they will have grown into strong bushy plants, sturdy enough to stand the frost, snow, and winds of any ordinary winter. During the first few weeks, when the growth is tender and soft, a sharp look-out must be kept for the Carnation maggot. Its appearance will

show in a whitish discolouration of one or more of the leaves. This is the track of the pest as it burrows its way inside the leaf towards the central stem. If found at this stage and killed, little or no harm will have been done, but if it is neglected or overlooked till the stem itself has been reached, the growing top of the plant will have been destroyed. If, however, it has not gone too far, side shoots will spring up from the base if the decayed part is removed, and a bushy plant will result, none the worse for its narrow escape. The maggot itself, a small cream-coloured grub about one quarter of an inch long, or less, according to its age when discovered, is the larva of a fly technically known as *Hylemyia nigrescens*; and there is no remedy against its ravages but hand-picking. Seedlings are much more readily attacked than older plants or layers.

If higher quality of flowers is wanted than that provided by seedlings, the grower must obtain a stock of named varieties which have been layered during the summer, and these will be ready to send out from a nursery in September and October. The beds should have been prepared and made ready for their occupants not later than the end of August, so that the soil will be thoroughly settled before planting time. The best time for this is during the latter part of September and early October. The layers, already well rooted, must be planted firmly, and will then have a few weeks to take thorough hold of the new soil before winter sets in, and they should grow away strongly in the spring with a better chance of acquitting themselves well the following summer than plants put in later in the year, or held over till the beginning of the growing season.

I would like to emphasize the necessity of firm planting, which is specially conducive to the well-being of Carnation growth. It also secures the plants from being knocked about in winter storms, and from being loosened in the soil by the action of frost which would seriously interfere with root growth.

As seedling plants make larger and freer growth than layers, I recommend these to be planted eighteen inches apart, with about fifteen inches for layers. This will give room for subsequent layering, and for hoeing to keep down weeds and preventing caking of the surface in hot dry weather.

Many people like to have other plants growing amongst their Carnations, but, on the whole, I think it better to devote beds entirely to them. May-flowering Tulips, however, or the early bulbous Iris, do not interfere to any great extent with the Carnations, as they bloom and mature their foliage before the latter reach the full extent of their development; so, if a lengthened period of flowering is wanted, I can recommend the interplanting of the above; or the choicer Narcissi would do equally well.

Both seedling Carnations and plants grown from layers produce many more buds than could ever come to perfection as flowers. It is wise therefore to thin out the surplus buds as soon as they can be handled. As we are now dealing with the Carnation as a border plant,

I need not refer to disbudding as practised by those who exhibit the blooms, but for a garden display a certain amount of thinning is certainly beneficial. Buds almost always form immediately at the base of each main bud, and these should certainly be removed. As regards buds arising from the leaf axils on the stem, four to eight of these may be retained according to the strength of the plant, the small buds below them in each case being nipped out when quite young.

Seedling plants, if well grown, may throw fifty to one hundred flowering stems, and if each of these is allowed to retain four good buds a fine show of blossom will result.

Should the weather be hot and dry, syringing during the evening or on dull days will encourage lusty growth, and at the same time check the ravages of thrips and green-fly. No artificial manuring should be needed if the preparation of the beds was thorough, but, on light soil especially, a mulch of rotted manure will be advantageous if applied a week or two before the beginning of the blooming season.

Until quite lately one was always recommended to attach calyx bands to the buds to prevent bursting, but that is a laborious practice, and there are now so many fine varieties whose calyces show no tendency to burst that this tiresome duty may be said to have been removed from the calendar of operations.

When seedling plants are in bloom, they should be gone over carefully to note any that are worth layering, whilst "singles," "bursters," and worthless sorts generally can be immediately rogued. Before the middle of July many of the plants will be ready for layering, and this operation can be continued also throughout the following month, although it must be borne in mind that early layers make the best and strongest plants. The process of layering is quite simple, and is really merely a form of pegging down. To hasten rooting, a slit is cut from the underside of the shoot, through a joint, and then pegged firmly into the soil, where it will start rooting in a week or ten days if kept just moist. In six weeks the layer will be strongly enough established to be severed from the parent plant, though, as there is no hurry to replant till September, a week or two longer may be given with advantage, especially if the weather has been hot and dry. Bearing in mind that a certain percentage of loss must be expected during the winter from wireworm, cats, and other causes, it is wise to put down more layers than are actually required. After filling the new beds, all surplus layers can be potted up, and kept in a frame or cold greenhouse during the winter to take the place of a possible casualty. In February or March they will come in very well for filling gaps in the beds where mortality has occurred from any cause.

Before concluding, I should like to say a word on the use of artificial or chemical manures and patent so-called plant foods. We have made many exhaustive experiments with every known kind, long since coming to the conclusion that the finest and most valuable manure or stimulant for Carnations of all types is sheep or cow manure, and soot used either dry on the beds or as a liquid. As a matter of fact,

Carnations of all types produce far finer stock and better bloom if grown in a compost good enough and rich enough to carry the plants from planting until layering. If the season is a dry one we find that watering with weak liquid manure is very beneficial, and always helps to develop strong grass—a great consideration if the plants are required to be layered.

To make it, take two gallons of fresh sheep manure and place in a sack with ½ gallon of soot ; tie up securely and sink in a tub of water holding, say, twenty gallons ; after two days squeeze the sack well and the liquid will be ready to use in a proportion of one pint to a gallon of water.

INVESTIGATIONS ON THE NARCISSUS DISEASE.

By J. K. RAMSBOTTOM, Research Student.

[Read before the Horticultural Club, May 8, 1917.]

SIX months ago, when the Royal Horticultural Society asked me to read a paper on the Narcissus disease, I thought I might find myself in the position of Canning's knife-grinder who had no story to tell. I however fell in with the suggestion that I should give a *résumé* of my investigations up to date. I was appointed in June last by the Royal Horticultural Society to investigate the disease of Narcissus commonly attributed to *Fusarium*, and but for the abandonment of the Daffodil Show my lecture would have been delivered before that Society. The Horticultural Club, on hearing of the abandonment of the Show, and knowing the keen interest taken in the Narcissus disease, invited me to deliver the lecture to its members. Hence my presence here to-night.

On taking up my appointment a note was published in the leading horticultural papers inviting bulb growers to forward diseased specimens to Wisley. As a result of the splendid response of growers, hundreds of bulbs passed through my hands even during the first few weeks of the investigation, and thousands of slides were prepared. I was also given the opportunity of visiting a number of nurseries and bulb farms, and given practically a free hand on the approach of the lifting season. It is with much pleasure that I acknowledge the great assistance and exceptional courtesies I have received from many growers.

When the investigation was commenced the disease was usually attributed to *Fusarium bulbigenum*, chiefly, no doubt, on account of the work of the late Mr. MASSEE, which was published first in the *Kew Bulletin* and then as a Board of Agriculture leaflet—but which was very incomplete.

An investigation by Miss WELSFORD at the Imperial College of Science, which had been in progress for two years, was said to point to a fungal or bacterial origin of the disease. Special attention was therefore centred on the possibility of *Fusarium* being the cause of the malady ; but it was soon seen that this fungus was of remarkably rare occurrence. When it was present it was always in association with a parasitic eelworm, and it was at first thought that there was possibly some connexion between the two organisms. As the work advanced, observations in the field and laboratory showed that the parasitic eelworm was the main factor to be considered. This eelworm agrees in all respects with the descriptions of *Tylenchus devastatrix*, Kuhn.

When the members of the Narcissus Committee of the R.H.S. visited

Wisley in July last, a small exhibit was arranged in the laboratory, and I then expressed the opinion that eelworm was probably the cause of the trouble, but inoculation experiments were necessary before any definite statement could be made. These have since been carried out.

Bulbs attacked with the eelworm disease exhibit certain symptoms which are now well known and easily recognizable. No one symptom can be regarded as definitely characteristic of the disease. The disease may show itself in the bulb, or in the foliage, or both. The fleshy scale leaves, sometimes one, at other times a number, of an infected bulb, show a distinct brownish colour, and when the bulb is cut across horizontally the diseased scale leaves take the form of rings (fig. 17); hence the name "ring disease" which is a descriptive and suitable popular name for the disease. It is in this brown mass that eelworms in all stages of growth are readily discernible when the tissue is teased and examined under the low power of the microscope. The bulb may be so affected that the growing scales and embryo flower are diseased. If so, the bulb when planted, if it grows at all, throws up sickly yellow foliage which twists and turns in all directions (fig. 18). The leaves are silky and spongy in texture and marked with long brownish diseased areas, at times running along the whole edges of the leaves, while irregular whitish eruptions caused through the breaking of the epidermis may appear (fig. 19). The flowers resulting from such bulbs are stunted in growth, as the photograph (fig. 20) clearly illustrates. The growth of diseased bulbs is generally much retarded as compared with that of healthy bulbs, but the extent of this depends upon the degree of infection. Healthy bulbs and diseased bulbs of the same variety were planted in pots, grown in cold frames, and given exactly the same treatment. The healthy bulbs flowered at a time when the diseased bulbs had made but an inch or two of growth (fig. 21).

In cases where the bulb is but slightly diseased, the growing leaves and flower may be unaffected. The foliage then appears, and probably is, perfectly healthy, so that though the leaves show no signs of the disease, it does not necessarily mean that a healthy crop of bulbs will be harvested. It may be regarded as certain, where sickly, deformed yellowish foliage is seen, even when an inch or two of growth has been made, that the bulb is affected, and no time should be lost in carefully removing it.

After many failures, a method was devised by which *Tylenchus* could be successfully isolated and grown in pure culture, and inoculation experiments were commenced without delay. On September 7 a few eelworms were pricked into the necks of healthy bulbs by means of a sterile needle, and the bulbs planted in steam-sterilized soil in pots and stood in a cold frame, where they remained throughout the experiment. Control experiments were arranged, healthy bulbs being grown in sterilized soil, the necks pricked with a sterile needle, but no eelworms introduced. On February 19 (six months after inoculation) the bulbs were lifted, and eelworms, which were found in all

Fig. 17.—A Narcissus Bulb cut in half, showing the dark Rings of damaged Scales due to Eelworm attack.

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FIG. 18.—NARCISSUS ATTACKED BY EELWORM.
Showing stunted and contorted foliage characteristic of a bad attack.

stages of development and in great numbers in the inoculated bulbs, had travelled down from the neck along the fleshy scales and entered the basal plate, and in doing so had left the brown stain so characteristic of a diseased bulb. There was not a single instance in the dozen or so bulbs inoculated which did not show these characteristics in a marked degree (fig. 22, A). The bulbs in the control experiment were perfectly healthy (fig. 22, B).

Another series of inoculation experiments was arranged in the greenhouse. Healthy bulbs were grown in pots, and on February 22, when the flowers were just bursting into bloom, the plants were inoculated in the following ways:—

(*a*) Eelworms introduced into the wound left from picking off the undeveloped flowers,

(*b*) Eelworms pricked into the leaves 4 inches above the neck, and

(*c*) Eelworms placed on uninjured leaves at the same distance from the neck;

(*d*) Used as a control.

In less than a week evidence of disease was apparent. In (*a*) the flower stalk rotted and showed a wrinkled, marbled appearance; it also became very deformed, swollen, and angular, as fig. 23 clearly shows. The same plant is shown in fig. 24, A. In (*b*) and (*c*) (fig. 24, B, C) the leaves soon lost their rigidity and fell over the sides of the pots in all directions, and showed the same wrinkled and distorted appearance as in the inoculated flower stem. Fig. 25 shows the invasion at (*a*) of the uninjured leaf referred to in (*c*) above, by the eelworms, with a healthy leaf for comparison. On April 20, eight weeks after inoculation, some of the plants were lifted and cut. The photographs (figs. 26 and 27) demonstrate that the eelworms had not been inactive. Infection occurred in all cases where inoculation was attempted, and none of the control plants showed the disease.

Tylenchus devastatrix was first described by JULIUS KUHN in 1858 as being the cause of a disease in *Dipsacus Fullonum*, the Fuller's Teasel, under the name *Anguillula dipsaci*; but as he afterwards found that the same eelworm could attack oats, buckwheat, and other plants, he considered the name *Anguillula dipsaci* too restricted, and, disregarding the customary rules of priority, changed it to *Anguillula devastatrix*. BASTIAN, who did important work on the classification of eelworms about 1860, incorporated *Anguillula devastatrix* with several other eelworms in the new genus *Tylenchus*, and the eelworm with which we are now dealing became known as *Tylenchus devastatrix* Kuhn. In 1881 PRILLIEUX worked on the eelworm malady of Hyacinths. To this eelworm he gave the name of *Tylenchus hyacinthus*, while in 1883 BEYERINCK published a paper on the eelworm malady of Onions, which at that time was spreading rapidly throughout Holland, and which he attributed to *Tylenchus allii*.

In 1888 RITZEMA BOS, one of our foremost Nematodologists, definitely proved that *Tylenchus hyacinthus*, *Tylenchus allii*, and *Tylenchus devastatrix* were one and the same species. The same

worker, in the valuable contribution "L'Anguillule de la Tige," gives a list of some forty plants which are susceptible to the attacks of *Tylenchus devastatrix*. This list includes, among our principal food crops, Rye, Oats, Onions, and Clover, and in a less degree Barley and Wheat. Among flowering plants, Hyacinths, Scillas, and *Galtonia candicans* are included in the list. Narcissus is not, however, mentioned. Some of our commonest weeds, such as Sweet Vernal Grass, Meadow Soft Grass, Annual Meadow Grass, the Buttercup, the Daisy, and the Plantain are also liable to infection.

In 1900 Ritzema Bos put forward the biological-strain theory, which, in brief, is that *Tylenchus devastatrix* becomes so adapted to a particular species of host plant after growing on it for several generations, that it will not attack with any severity any other species. Further, taken from such a second species, it will not attack the original host with severity until after several generations have passed. For instance, according to him the Narcissus strain is not likely to affect onions with any severity, and vice versa, although the two strains are absolutely indistinguishable under the microscope. In like manner, it has been suggested by several investigators that the root-knot eelworm *Heterodera radicicola* may show similar biological strains with no apparent morphological differences.

In conjunction with the series of inoculation experiments performed last September, to which reference has already been made, certain experiments were carried out to test the truth of this theory. Healthy bulbs were planted in sterilized soil and onion seed sown on the surface. The pots were watered twice with eelworm cultures (the eelworms being originally taken from Narcissus bulbs) at the interval of a fortnight. The eelworms had their original diet to feed upon, but, in contradiction to the biological-strain theory, all the seedling onions were attacked. Another similar experiment was made by sowing onion seeds in sterilized soil in pots and watering once before germination with water containing the Narcissus strain of eelworm. Six weeks after sowing, although the seed showed a moderate germinative capacity, practically none of the seedlings carried the seed husk at their tip, and abnormal twisting or bending was very noticeable. The young plants were of a lighter green colour than those in the control pots. The seedlings in the infected soil gradually died off, and on examination were found to contain *Tylenchus* in numbers. I have a photograph showing the characteristics of the diseased seedlings, illustrating especially the swollen bases and deformed growth.

Scilla nutans has also been successfully cross-inoculated with the Narcissus strain of *Tylenchus*, and a number of other crops are under observation.

This phase of the subject has been treated in detail because it opens up a very wide field and is of great economic importance on account of its bearing on the rotation of crops. For instance, in parts of the country where bulbs are grown in rotation with agricultural crops, it is of little use, in attempting to control Narcissus disease, to grow

crops liable to infection, and in which eelworm can tide over until the ground is again occupied by bulbs. Whilst on a visit to Spalding last July, the susceptible crops in the district were examined for eelworm. In two instances onions, lucerne, and clover (all susceptible crops) were found growing in close proximity to diseased Narcissus bulbs, but it must be confessed no damage appeared to have been caused by eelworm. One criticism I would reply to in advance. The cross-inoculation experiments at Wisley have been conducted under glass and many factors eliminated which come into play in the open air. However, it seems certain that the problem of rotation will have to be considered if a successful cure is to be found.

An important question under consideration is to ascertain in what manner bulbs become affected, and a series of experiments, which are not yet completed, has been arranged. It appears from field observations that the disease commences in the neck of the bulb. The leaves at the surface and below the ground level become a decayed squashy mass, and, in consequence, they lose their elasticity and topple over in all directions. These leaves do not show the twisting characteristic of the diseased foliage from a diseased bulb. This decay in the neck is usually evident in late May and early June at a time when the foliage is withering, and the symptom is sometimes confounded with the natural decay of the leaves. Many growers are of the opinion that moist, dull, warm weather favours the spread of the disease at this stage, and such conditions possibly aid the development of eelworms and render them more active. Exactly how the eelworms gain an entrance has yet to be shown. It is generally believed that foliage injured by frost and other external agencies offers a ready means of access. This may be so, but the leaf-inoculation experiments prove that eelworm is capable of itself of gaining an entrance owing to its possession of a spearing apparatus—a needle-like structure present in its gullet. In the case of a healthy bulb planted in infected soil the hard, brittle outer scales would afford natural resistance to the entrance of the eelworm, and in preference it would attack the soft growing foliage. In any case, the eelworms usually attack the leaves at the neck, and this is a possible explanation of the decay of the foliage at this point. Once inside the leaves, the *Tylenchus* makes rapid downward progress to the basal plate, where it appears to find better conditions of growth. Here the eelworms propagate most freely, the basal plate splits away from the bulb, and often the eelworms are to be seen in masses resembling cotton wool hanging from the base (fig. 29). At this stage the eelworms leave the bulb *via* the broken basal plate and enter the soil, attack other bulbs, and so spread the disease. The bulb-mite and fungi, possibly including *Fusarium*, then gain an entrance.

In cases where flowers are picked (as in the case of the Daffodil flower industry, where many flowers are picked in the bud stage and opened indoors) the wound so left affords a ready means of entry for eelworm from the soil. In order to obtain a long flower-stem, they are picked as far into the neck as possible, sometimes below the

ground level, and an ugly wound results. No bulb treated in this manner can be expected to remain free from disease in an infected soil, and the practice doubtless helps to spread *Tylenchus*. Wherever it is practicable, the flower stalks should be cut an inch or so above the ground.

When bulbs are in a dormant state it is a very difficult matter to distinguish one which is healthy from one which is slightly diseased: in fact, it seems quite impossible without cutting open the bulb. Accounts have been heard of many growers' experiences in this matter. For instance, bulbs have been carefully hand-picked, and those passed as apparently sound have been "trayed." Within a fortnight the bulbs have again been re-examined and numbers destroyed as unsaleable. This goes on and on, so that it is not surprising to hear the remark that the disease spreads rapidly in storage. I do not think it is a case of a diseased bulb affecting its neighbours to which the cause of this rapid spreading can be attributed, but rather that the bulbs passed as sound were slightly diseased, and after a week or more the eelworms had made their efforts recognizable. That such seems likely is seen from the following: healthy bulbs have been placed in trays among diseased ones and left over a period of three months, at the end of which time the latter were a decayed and rotten mass and the healthy bulbs still plump and hard, but probably not free from eelworms on their outer scales. No trace of eelworms could be found inside the healthy bulbs. It is not to be implied that no harm will result by storing the bulbs under bad conditions. Certain factors, such as humidity of atmosphere and temperature, may aid to bring about the decay of bulbs very rapidly.

For experimental purposes it was necessary to divide the bulbs into two classes, viz. healthy and diseased, and a simple method was devised in order to distinguish them. As clean a sample as it was possible to obtain was classed as healthy, and a diseased stock was obtained of the same variety. Of the diseased stock all bulbs which were evidently badly diseased and incapable of growth were discarded. The others were topped by cutting off a quarter of an inch or so of the bulb at the neck. After a little experience it was possible to distinguish with confidence the brown scale affected with eelworm from the brown scale resulting from natural decay and withering. The healthy bulbs were treated in the same manner. Topping is not detrimental, providing it is performed shortly after the bulbs are lifted. At such a time the growing part is not touched, and the bulb heals its wound before planting time arrives. A precaution should be taken to dip the cut neck in sulphur as a preventive against other diseases. There is another point in connexion with the topping of bulbs which must not be lost sight of, more particularly in compound bulbs. It sometimes happens that the eelworm spreads from the neck of the parent bulb down to the basal plate, along which it travels to the offset. Should the disease originate in the offset it may in like manner affect the parent bulb. The disease then spreads upwards from the base, usually

FIG. 19.—NARCISSUS KING ALFRED ATTACKED BY EELWORM.
Showing the eruptions on the foliage.

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FIG. 20.—NARCISSUS 'GOLDEN SPUR' ATTACKED BY EELWORM.
Showing the stunted growth of the flower.

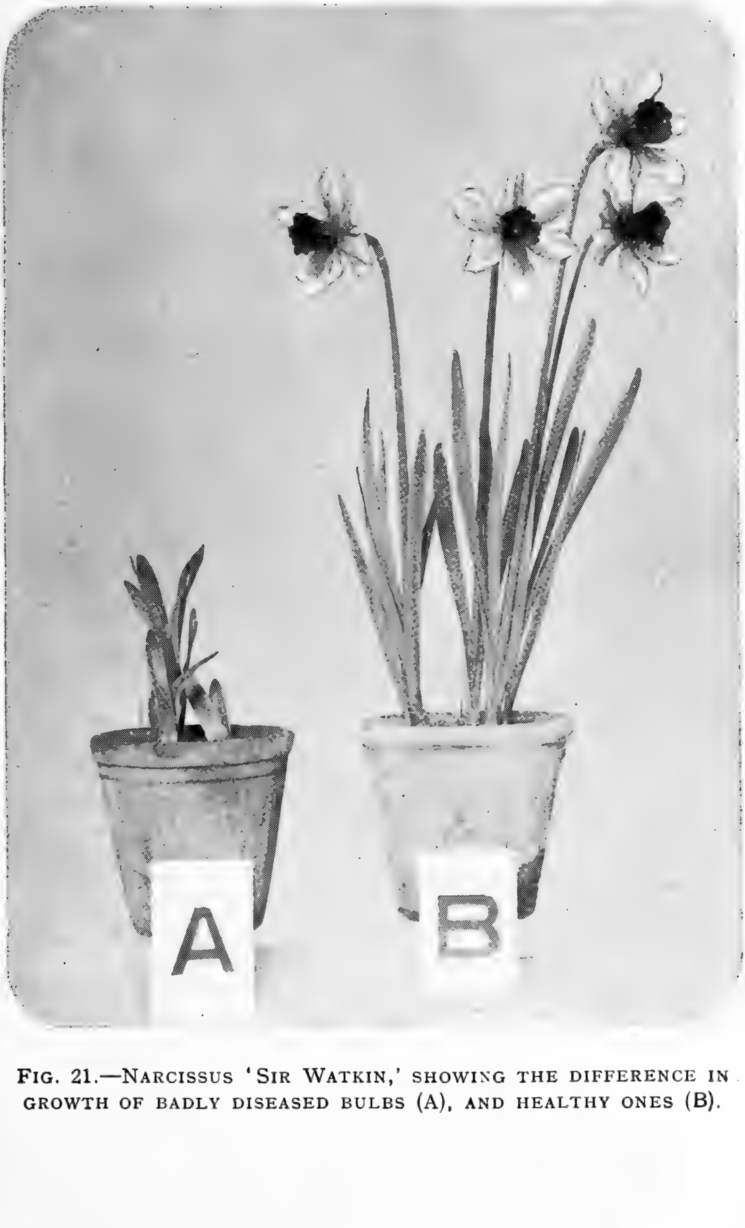


FIG. 21.—NARCISSUS 'SIR WATKIN,' SHOWING THE DIFFERENCE IN GROWTH OF BADLY DISEASED BULBS (A), AND HEALTHY ONES (B).

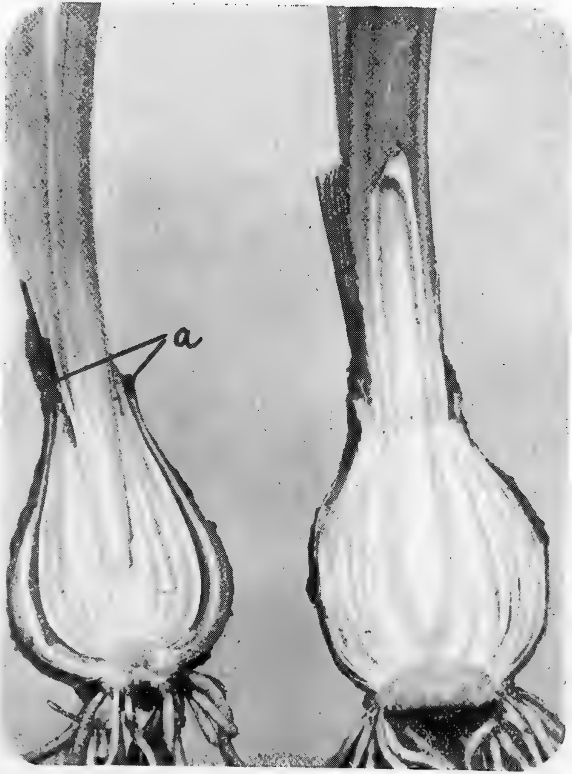


Fig. 22.—Bulb A, six months after artificial inoculation of dormant Bulb at point (*a*) with Eelworms. Showing destruction of whole scale. Bulb B, not inoculated and grown in sterilized soil.

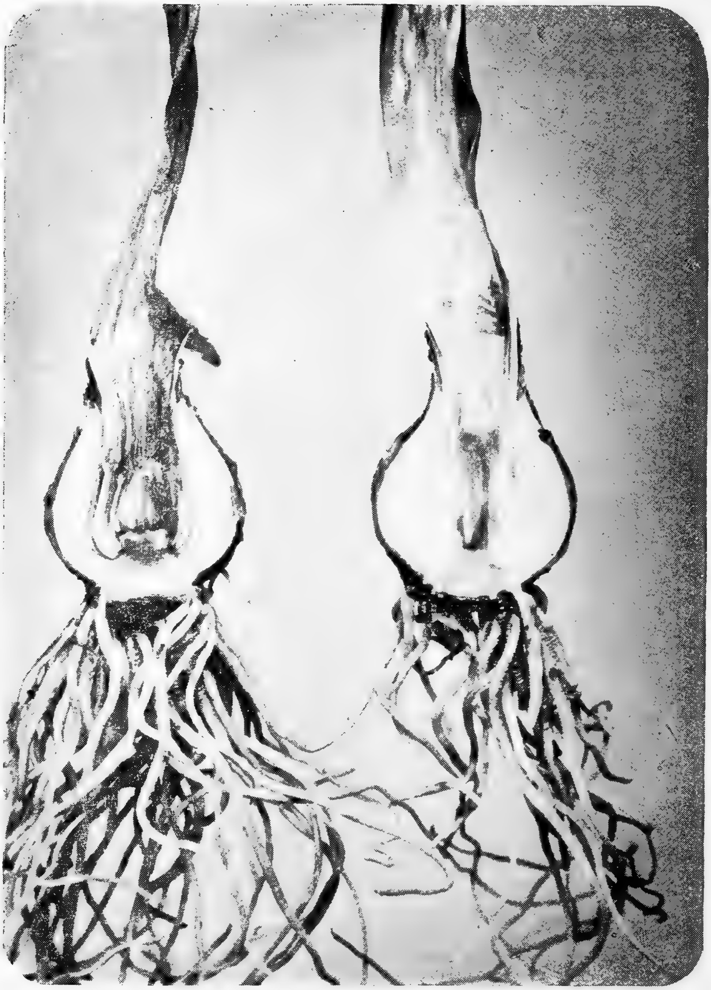
Fig. 23.—Narcissus inoculated with Eelworms at broken end of flower-stalk (*a*). Cf. Fig. 26.

FIG. 24.—EELWORM ATTACK ON NARCISSUS PLANTS.
A, Inoculated in broken flower-stalk. B, Inoculated in leaves. C, Inoculated by contact on uninjured leaves. D, Healthy plant not inoculated.

FIG. 25.—A, UNINJURED LEAF OF NARCISSUS INVADED BY EELWORM.
B, A healthy leaf for comparison.

A D

FIG. 26.—A NARCISSUS BULB FROM POT A (FIG. 24).
Showing (*a*) point of inoculation in flower-stalk, and (*b*) invasion of the basal plate by eelworms. D is a healthy bulb from pot D (fig. 24).



B C

FIG. 27.—NARCISSUS BULBS FROM POTS (B) AND (C) (FIG. 24).
Showing invasion by eelworms from inoculations in the foliage leaves.

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attacking all the scale leaves. In such cases each "nose" of the bulb must be topped, otherwise there may be no trace of the malady if one "nose" only is cut. Bulbs thus affected, however, generally exhibit rottenness at the base.

It will be of interest to hybridists to mention the fact that *Tylenchus* has been found in both the mature and immature carpels of the flower. In the mature carpel examined no seeds had formed, but it is quite possible that had seeds developed they would have contained eelworms, judging from the analogous case of oats, which when affected in the grain gives the plant an appearance as though attacked by Ergot. It has often been said that the disease never makes its appearance in seedlings until after the bulb flowers. This seems unlikely, and experiments to test it are under way. One raiser went so far as to say that as soon as he named a seedling he killed the bulb. On going into details of cultivation, the writer was informed that the seedlings were pricked into beds in cold frames, where they remained until they were of flowering size, and then they were planted in the open ground. The bulbs flowered the first year, and those found deserving of a name retained. The next year the disease made itself evident, and thus this hybridist was, no doubt, justified in making the above remark. If, however, the seedlings had been pricked out into beds in the open air instead of in cold frames, the results might have led him to a different conclusion. If onions can be, and are, affected as soon as they germinate, there is every reason to assume that Narcissi can be likewise attacked.

During the investigation at least two species of *Fusarium* have been isolated in pure culture, and plants have been inoculated in the following manner: (1) on the wound left by removing the flower stem, (2) on the injured foliage, and (3) on the uninjured foliage. The plants were grown under bell glasses in the greenhouse at a temperature of about 60° F. The experiments are at present in progress, but the fungus is of very slow growth, and the attack upon the foliage cannot be compared with the rapidity with which *Tylenchus* affects plants grown under exactly the same conditions, inoculated at the same time and in the same manner. When healthy leaves are placed on moist blotting-paper in Petri dishes and kept at room temperature the *Fusarium* makes rapid growth both on injured and uninjured leaves.

Many bulbs affected by *Fusarium* were found in the storage sheds of a large bulb farm in the south of England, and in every case the *Fusarium* had occupied the damaged bases of bulbs already affected with eelworm. This *Fusarium* appears to be the species described by Mr. Massee as being the cause of the disease. Another species was found at Wisley, appearing in salmon-stained tissue of eelworm-affected bulbs.

Bulbs have also been received affected by *Merodon*, *Sciara*, bulb-mite, and *Eumerus*, while among fungi *Sclerotinia bulborum*, *Phyllosticta Narcissi*, and *Stagonospora Narcissi* have been seen; the two

latter appear on the leaves and have not previously been recorded for this country.

A quarter of a century ago there was very much written in the horticultural press regarding the mysterious disease known as "basal rot." It will be interesting to hear more of this disease from present-day cultivators, as it is not at all certain whether it is in any way connected with the one under consideration. In an article written in 1894 by the Rev. WOLLEY-DOD on "basal rot" the word "eelworm" is mentioned, but as to whether it was of a parasitic nature or a free-living form no remark was made. I have yet to see a bulb affected with a basal rot other than that due to eelworm.

A delicate method has been devised for testing soil for the presence of eelworms. Ten grams of soil are ground up in a mortar with 100 cc. of water and the muddy liquid poured into the cups of an electrical centrifuge. The centrifuge is then worked at a fairly high speed until the soil lies at the bottom of the cups. The opalescent liquid is then decanted and spun a second time at a higher speed; the sediment now sinking to the bottom contains the eelworms, together with other living organisms of the soil. To apply this test to large areas of ground, a large number of samples would, of course, need to be taken.

It is a difficult matter to offer anything like a complete survey of the work in hand, inasmuch as it consists of a large number of inter-related experiments from which at present no results have emerged, though the sum of the experience gained indicates clearly enough that eelworms are responsible for much more damage than has hitherto been thought—if not the whole of it.

With regard to the treatment of the disease, a phase of the investigations which is occupying the major portion of my time—no definite statement can yet be made. A satisfactory method may in time be found, but it is feared the investigations will require a good deal of patience.

The remedies, if such are found, will need to be tested on a large scale or proved to be what are generally termed "commercial propositions" before they can be generally applied. The difficulties are chiefly connected with the conditions under which *Tylenchus* can exist, and therefore concern the most suitable method of attack.

Tylenchus can be dried for lengthened periods looking as if dead, yet still retaining the power of resuming vital functions on being moistened. As far back as 1744 this power possessed by eelworms was investigated.

An experiment was performed last August by placing eelworms on slides in a desiccator for eight weeks. On examination they were found to be curled up like Catherine wheels, but on application of moisture a large percentage showed the eel-like movement when examined three hours later. Dr. RITZEMA BOS has investigated this power of *Tylenchus* with the thoroughness which stamps most of his work. He has shown that unsegmented eggs of *Tylenchus* might be safely dried

for a period of two months, but if allowed to remain dry for a year only about one-third recovered on being moistened; the other two-thirds were dead. Eggs, however, of which the contents were divided into 2, 4, 8, or 16 divisions, could not bear desiccation for even six days. Eggs further advanced and containing the eelworm in embryonic condition could remain in a state of suspended animation for six months (possibly longer) without losing the power of recovery on the application of moisture. The power of larvæ to regain conditions of active life after desiccation was found to be very great, and the results of experiments carried out by RITZEMA BOS showed that after suspended animation during a period of two and a half years they returned to their normal state. The adult *Tylenchus* (that is, those in which differences in sex are discernible) could not support life under desiccation.

From the results gained it is possible to suggest some general principles which should guide the attempt to find effective and economical remedies and preventive measures. There seem to be four possible interrelated ways of this: 1. Rotation; 2. Treatment of infected ground; 3. Treatment of bulbs; 4. Trap or "cure" cropping.

Rotation is included among the measures of prevention as it is of importance to give such a rotation as will not give a crop liable to be attacked in immediate succession to one which is known to have been infected with eelworm. Oats, onions, and clover are the crops which suffer most severely with us; but many other plants are liable to be attacked. When a field of oats or clover, for instance, is infected, it is difficult to clear and also to prevent the attack being carried about in manure, as a portion of the eelworms, very possibly most of them, customarily leave the dying plants and go into the soil; some are carried away with the cut crop, and, being mixed up in the straw with farmyard manure, are presently carried out again and spread quite uninjured on clean fields or perhaps in the very fields from which they came, in readiness to attack a susceptible crop—Narcissus, for example—if it is planted down in such fields.

It should also be borne in mind that eelworms can be conveyed in infested earth, such as clings to wheels of carts and ploughs, to boots of workers and to farm implements, and, from their power of propagation, a small beginning makes much trouble. To carry out the rotation so as to starve out the eelworm, the crops planted must be immune towards nematode attack, so that the larvæ in the soil cannot find nourishment. The crop grown should be economically profitable; and, if possible, it should be such as to enrich the land, or at least not impoverish it. The crop should be one of vigorous growth, so as to choke out all weeds or other plants which might harbour eelworms and permit of their development.

An ideal method of starving out the eelworm would be to allow the ground to lie fallow for a long period, keeping it free from weeds by thorough cultivation. It is evident that by such a method the

eelworms would be ultimately starved out; but the method is impracticable in the majority of cases because of its costliness.

Treatment of Ground.—Trenching can be applied in small areas, and to bury the eelworms as low as possible would do much to lessen the danger of attack. On larger areas ploughing with a skim coulter attached will also bury the eelworms to a fairly low depth. To resort to ordinary ploughing or digging would merely aid in distributing the eelworm over a larger area than previously. In the "Journal of the Board of Agriculture" for 1913 there appears a contribution on "Clover Sickness," in which it is stated that "it has been proved that when eelworms are buried to a depth of 5 in. they are killed." I have, unfortunately, not yet succeeded in tracing a record of the experiments which led the writer to arrive at these conclusions. Bulbs planted 8 in. deep have been found on lifting to be badly diseased, but the infection may have taken place near the soil surface.

Rich manuring, so long as there is no risk in bringing eelworms to ground in infested manure has been advised for other crops. One recipe found to answer well for attack in oats and onions was:

Sulphate of ammonia . . .	4 parts.
Steamed bones . . .	2 ,,
Sulphate of potash . . .	1 part.

This was applied at the rate of $1\frac{1}{2}$ cwt. to the acre, followed by a dressing of two cwt. of sulphate of ammonia to the acre. This mixture gave such a luxuriant growth that in a little more than a fortnight after the second dressing the unhealthy plants, if any remained, ceased to be noticeable. Sulphate of potash is also confidently recommended. Applied at the rate of 3 cwt. to the acre, it answered admirably for infested oats, and no doubt such a dressing applied to ground occupied by bulbs might definitely help the plants to resist the attacks of eelworm by increased luxuriance and by reason of the potash hardening the leaves in texture and so impeding the entrance of the pests. It must be clearly understood that these experiments refer to the onion and oat crops alone. Potassic manures are, however, difficult to obtain at the present time, and it is very doubtful if fertilizers can be depended upon to exterminate eelworm. All measures calculated to stimulate vigorous and healthy growth are serviceable in supporting infested plants, and it is hoped to give this question of manuring the fullest consideration next season.

The types of soils in which the disease has appeared have been noted, but as far as observations were made the eelworm exists equally well in heavy and light ground.

It has been seriously proposed to use steam to destroy eelworms in the field, in view of the fact that this treatment has met with great success when used in the greenhouse for cucumbers and tomatos attacked by the root-knot eelworm. No experiments have been made in this direction owing to the expense of the undertaking. A very large boiler and thousands of feet of perforated piping would be

A

B

FIG. 28.—NARCISSUS BULBS.
Showing (A) the typical appearance of the neck of a healthy bulb, and (B) the broken-down neck of a diseased one.

[To face p. 60.

FIG. 29.—NARCISSUS BULB ATTACKED BY TYLENCHUS.
Showing protruding masses of eelworms at base.

[*To face p.* 61.

necessary in order to treat the soil by the greenhouse method, and it is doubtful if the treatment would be beneficial. Small areas or beds, especially those to be occupied with seedlings, might be profitably steam-sterilized by the inverted-pan method. Sterilization with chemicals such as formaldehyde, toluol, carbon bisulphide, naptha-lene, &c., offers possibilities of cleaning infected ground, but the larger the area the greater are the difficulties to be contended with in effectu-ally carrying out the treatment.

The treatment of bulbs by soaking has received much attention.* Last autumn about 3,500 diseased bulbs and the same number of healthy ones were treated in dozens with a large number of different chemical solutions. The minimum time for soaking was 18 hrs., and the maximum 96 hrs., with periods of 24, 48, and 72 hrs. intervening. In most cases different strengths of the same chemical solutions were employed, as it is evident that where the bulb is damaged by a liquid that liquid cannot be employed. Eighteen hours was taken as a minimum time, as it was thought that no solution could penetrate the bulbs sufficiently in less time to be effective. All the bulbs were topped. Recent observations show that the bulbs have been killed in some in-stances ; at any rate there are no signs of growth at the present time.

The warm-solution treatment of bulbs has been tried, and healthy and diseased bulbs have been soaked in water and chemical solutions of various strengths for 1, 2, and 4 hours and at a temperature of 43–44° C., 46–47° C., and 49–50° C. in each series. Healthy bulbs soaked in water and chemical solutions at the last-named temperature have been materially damaged, but the experiments are such that the results cannot be recorded until the bulbs are lifted.

HEWITT recognized some time since that *Tylenchus* was connected with the disease, and in a paper entitled "Eelworms in Narcissus Bulbs," published by the Department of Agriculture and Technical Instruction for Ireland in 1912–1913, recommends soaking the bulbs in copper sulphate solution at a strength from $5\frac{1}{2}$ per cent. to $7\frac{1}{2}$ per cent. for 17 hrs. On a recent visit to Ireland it was understood from one firm who had worked in conjunction with HEWITT that the treatment advised had been abandoned as the results did not prove satisfactory. HEWITT died in the midst of his investigation, and the published pamphlet is a record of his unfortunately uncompleted work.

Coupled with the warm-solution treatment, a series of experiments were performed with the Reichert thermal stage, by means of which apparatus it is possible to record, with some degree of accuracy, the length of time an eelworm is capable of life at a fixed temperature. Between 43 and 44° C. all eelworms were killed at the end of 45 minutes. At a temperature between 48–49° C. the eelworms succumbed at the end of 15 minutes; 52–53° C., 11 minutes; 53–54° C., 9 minutes; 55–56° C., 9 minutes; and 57–58° C., 5 minutes. The effect of tem-perature on the eggs was not considered.

No matter in what manner the bulbs are treated, it is courting

* See p. 65.

disaster to plant again in infected ground, and land which has never before been utilized for bulb cultivation is not necessarily free from *Tylenchus*, seeing that this eelworm is capable of attacking some of our commonest grasses and weeds.

Trap or "Cure" Cropping.—In 1880 KUHN devised a method of reducing the injury caused by the eelworm *Heterodera Schactii* in sugar beet, based upon the principle of trapping the eelworms in some susceptible plant and destroying the crop before the nematodes again entered the soil. He used a variety of rape for the trap crop, which was sown and removed from three to five times in the season. The number of eelworms was reduced by this method, and profitable crops could be grown again for several years. This method has more recently been employed in America for controlling the root-knot eelworm (*Heterodera radicicola*) but without success. For the eelworm under investigation a suitable trap crop may be found, but it will have to be one of which the seed is cheap, of easy culture, showing great susceptibility to attack, of quick growth, and which can be readily removed.

It appears to be generally held by growers that bulbs naturalized in grass escape the attacks of *Tylenchus*. If this be true, can it be that certain grasses attract the eelworm, or that soil conditions of grass land, such as lack of air, are unsuitable for the development of eelworm? Or is it that certain grasses excrete toxins which render the soil unfitted for the eelworm? On the other hand, bulbs grown for naturalizing are generally planted in drifts and left undisturbed for years, and as a consequence grow freely, so that, should any succumb to the disease, they are not missed. One large grower in Guernsey seems so convinced that bulbs in grassland are unaffected that he has left his beds unweeded and is experimenting in other directions.

Bulbs which have been left in the ground from lifting and thrown into the hedges when the land was cleaned for the next crop have been seen to make very luxuriant growth under such conditions, but whether the bulbs were healthy or diseased in the first place was not ascertainable.

In this country the treatment of Narcissus bulbs attacked by eelworm had received no attention except from HEWITT. Last July, when I had convinced myself that eelworms were probably the cause of the disease, I wrote to Prof. RITZEMA BOS concerning *Fusarium*. He replied as follows:

"I can assure you that I never have found in Holland a *Fusarium* disease in daffodils (Narcissus).

"Miss Dr. JOHANNA WESTERDYK in Amsterdam writes that a bulb-grower in Holland had sent diseased daffodils to Mr. MASSEE, who had informed him that he (Mr. MASSEE) stated them to be infected by *Fusarium*. Mr. MASSEE says that first the leaves of *Fusarium*-diseased daffodils show yellowish-coloured spots, which are soon covered with *Fusarium*; afterwards the bulbs are infected, and show brown circles when the top is cut off.

"Miss JOHANNA WESTERDYK never found *Fusarium* on the yellowish

spot of the leaves; sometimes she could make cultures of a *Fusarium* living in diseased bulbs, but infection of sound bulbs had no results, except as it seemed in one single case. Miss JOHANNA WESTERDYK doubts whether the *Fusarium*, which appeared on the diseased bulbs, was indeed a parasite. She could not state whether the *Fusarium* on her bulbs of Narcissus was identical with *F. bulbigenum* Massee. She found no chlamydospores in the leaves, as did MASSEE; for the rest, the conidiophores and the conidia, which she studied on the bulbs, showed a great resemblance to those described by Mr. MASSEE, but the description of Mr. MASSEE'S *Fusarium bulbigenum* is too incomplete for it to be possible to identify it with a certain *Fusarium*.

"The symptoms of the disease of daffodils, ascribed by Mr. MASSEE to his *Fusarium bulbigenum*, show a very great resemblance to those which are caused in the last years to daffodils by *Tylenchus devastatrix*, which since some two or three years has begun to attack also this genus of bulbous plants; and it seems very probable to me, that, in the case of MASSEE'S disease of daffodils, the attack of *Fusarium*, when present, is only of a secondary character, *i.e.* that this fungus lives in the bulbs, sometimes also in the leaves, as a saprophyte, whilst the real cause of the disease is another, in most of the cases *Tylenchus devastatrix*.

"So my opinion is that there exists no real *Fusarium*-disease in daffodils; but should there be such a disease, I can state that I never have found it in Holland. From this you see that I am unable to give you any information on bulbs affected with *Fusarium*."

I then wrote to Dr. WESTERDYK, Director of the Pathological Laboratory of Amsterdam, asking her to enlighten me on certain points in the investigation. In her reply she informed me that she was engaged upon the study of *Narcissus* bulb diseases in general, but that she thought eelworm was the most serious, although it had only been known in Holland for one year. Contributions from Dr. WESTERDYK have appeared in a Dutch trade paper, and I have to thank Mr. PETER R. BARR for his kindness in sending me a number of her articles which I received two or three days ago. On glancing through the contributions it is surprising to see that England is persistently mentioned as being the original home of the pest, but how the eelworm can have been responsible for the havoc it has made there in one year I cannot say. So serious is the trouble that another investigator, Dr. VAN SLOGTARE has been appointed by the Dutch Government to make a special study of the disease.

Miss WELSFORD, working at the Imperial College of Science, has, I understand, now come to the same conclusion as Dr. WESTERDYK, Mr. HEWITT, and others had already reached, and to which I was quickly forced by the results of the observations and experiments which I made at Wisley and elsewhere.

The origin of the first outbreak of the disease in this country cannot be traced. Some growers say it came from Holland, but, as we have seen, the Dutch say we had it here first; others say from Guernsey,

while there are others who maintain that the disease never appeared until new varieties were introduced in their collections. At first sight it certainly appears that the newer varieties are more addicted to the disease than the older ones. This may possibly, however, not be the case. When a grower brings new bulbs into his stock which was previously clean, he runs great risk of introducing eelworms. As very frequently it is the newer varieties that are added—and the bulbs may appear perfectly healthy—these new varieties are usually regarded as being more susceptible and so accounting for the spread of the trouble. If certain varieties prove to be immune we have a possible means of attacking the problem. WEBBER, ORTON, and others in America have endeavoured successfully to breed varieties of cowpea and other crops resistant to root-knot. It is perhaps a problem similar to that of rusts of wheat, where BIFFEN found that immunity is a recessive Mendelian character. Simple selection ought also to be practised; if in a field of Narcissus badly infected with *Tylenchus* certain of the plants remain outstandingly free, it would probably pay to begin propagating bulbs by offsets from these plants. The question of how such a common species as *Tylenchus devastatrix* suddenly became rampant amongst Narcissus bulbs is one of those problems which often face pathologists in general. Where did the variation occur, in Narcissus, in *Tylenchus*, or in both? Was it so sudden as most of us imagine?

There is much I should like to say regarding methods of cultivation, such as depth of planting, aspects, lifting annually, as against leaving the bulbs in the ground for two or more years, ripening, storing, forcing, etc., but the time at my disposal will not allow of it.

Many bulb-growers look upon the disease as "one of Nature's gifts," and are of the opinion that the bulbs will ultimately right themselves. The latter part of the statement opens up the whole question of health and disease in general. Suffice it to say that if the bulbs *are* left to right themselves, the bulb industry in Narcissus will soon cease to exist.

[The investigation of this Narcissus disease was undertaken jointly by the Royal Horticultural Society and the Imperial College of Science and Technology.]

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXXI.—Experiments on the Control of Eelworm Disease of Narcissus.

By J. K. Ramsbottom.

Historical Review of Treatments previously Applied.

In 1912–13 Mr. R. T. Hewitt carried out a series of experiments on the control of the Narcissus Disease, and, although his work was by no means completed, he recommended the soaking of affected bulbs in a cold solution of copper sulphate at a strength of from 5 per cent. to 7½ per cent. for a period of 17 hours. The effect of these solutions on the bulb, after soaking for the length of time stated, is recorded as being slightly injurious, and live eelworms were to be found in the centre of affected bulbs after treatment. A similar result was obtained by soaking the bulbs in a 10 per cent. solution of copper sulphate for 7 hours, while soaked in the same strength of solution for 24 hours no live eelworms were discovered in the treated bulbs. The bulbs, however, were badly injured by this strength of solution and therefore did not admit of this treatment being recommended. Mr. Hewitt also soaked bulbs in cold solutions of formalin 5 per cent., for 2 and 5 hours; formalin 10 per cent., for 1 and 2 hours; cresylic acid 2 per cent., for 1 and 2 hours; and paraffin for ½ and 1 hour; but in no case did the treatment kill the eelworms in the centre of the bulb.

The same writer conducted a few experiments with warm water at a temperature of 120° F., and records that all the eelworms are killed in bulbs soaked in water for 1, 2, and 6 hours at this temperature; the bulbs were killed even at the end of one hour by this process. Mr. J. W. Barr has also experimented with the warm-water treatment, and in the course of the discussion of my lecture (herewith published) he informed the audience that he had obtained excellent results by soaking infested bulbs in water at a temperature of 110° F. for a period of one hour.

Effect of Chemicals upon Tylenchus devastatrix.

Last August experiments were commenced with a view of finding some chemical method of controlling the eelworm attack on Narcissus bulbs. The first series of experiments was designed to test the effect of various chemical solutions and gases upon the eelworms by placing the worms in direct contact with the solution or gas. Where solutions were employed, the eelworms were placed in watch-glasses containing

the chemicals, while for gases Ward tubes and moist chambers were utilized. The results are recorded in Table I.

TABLE I.—THE EFFECT OF VARIOUS STRENGTHS OF CHEMICAL SOLUTIONS AND GASES UPON TYLENCHUS.

Solution.	Strength of Solution.	Time of Examination.	Results.
Potassium sulphate .	1 per cent.	2 days	alive
Potassium sulphide .	1 "	2 "	dead
Kainit . . .	1 "	3 "	alive
Common salt . .	1 "	3 "	alive
Lime water . . .	1 "	6 "	alive
Potassium permanganate	0·125 "	1 day	dead
Nicotine . . .	1 "	2 days	alive
Formalin . . .	commercial 40 per cent.	15 minutes	dead
Formalin . . .	5 "	2 days	"
Carbolic acid . .	1 "	1 day	"
Ammonia 0·880 (vapour)	full strength	2 minutes	"
Benzole (vapour) . .	"	1 minute	"
Carbon-bisulphide (vapour) . . .	"	"	"
Methylated spirit . .	"	"	"

It will be seen that the eelworms can withstand many solutions with no apparent ill effect, while other solutions act very injuriously towards them. Substances which are readily volatilized appear to be the most effective. It is interesting to note the effect of solutions of potassium sulphate and kainit, as dressings of these chemicals have been frequently recommended for keeping Tulip Root of Oats and Clover Sickness (diseases caused by the same pest) under control.

Effect of Treating Bulbs with various Chemical Solutions.

A long series of experiments was arranged in the autumn of last year, in the endeavour to find a palliative measure. Bulbs were soaked in a large number of chemical solutions for various lengths of time, healthy and diseased bulbs being treated in exactly the same manner. The confronting problem was to divide the bulbs into the respective classes—healthy and diseased. It is quite impossible, without cutting open the bulbs, to distinguish a slightly infected bulb from one which is perfectly healthy. The method adopted cannot be claimed to be infallible. Stocks of the varieties 'Emperor' and 'Sir Watkin,' as healthy as it was possible to secure, were obtained, samples of the bulbs being carefully examined for the presence or absence of eelworms. These stocks were classed as healthy. The diseased bulbs of the same varieties were obtained from stocks which had shown the characteristics of the disease during the growing season: these bulbs were then hand-sorted, and all those which were soft and had damaged bases were discarded as being incapable of growth. They were then "topped" in the manner explained on p. 56 in

order to avoid the great possibility of planting healthy bulbs, which are generally present in larger or smaller numbers in an infected stock. The healthy stocks were treated in the same manner to make certain that no diseased bulbs were present in the stock classed as healthy. By this means, as far as it was possible to ascertain, all bulbs classed as diseased were affected bulbs, while those placed under the heading of healthy were free from eelworm attack.

Twelve diseased bulbs and the same number of healthy ones were treated in each case, and planting was carried out in November 1916. In May 1917 the bulbs were lifted and the diseased ones microscopically examined to ascertain the effect of the solution on the eelworms.

Table II. presents the practical results of these tests, showing the duration of the time of soaking, the effect of the solution on the growth of the bulb (this being ascertained from the behaviour of soaked healthy bulbs), and the effect of the solution upon the eelworms. Eighteen hours were taken as the minimum period of soaking, as it was considered improbable that a solution could enter the bulb sufficiently to be injurious to the eelworms in less time. All the bulbs were treated in glass vessels and were planted directly after treatment.

TABLE II.—THE EFFECTS OF SOAKING HEALTHY AND DISEASED BULBS IN CHEMICAL SOLUTIONS.

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Creol . .	1 per cent.	18 hrs.	no injurious effect	live eelworms found
,, . .	,,	24 ,,	,,	,,
,, . .	,,	48 ,,	,,	,,
,, . .	,,	72 ,,	,,	,,
,, . .	,,	96 ,,	,,	,,
Creol . .	2 per cent.	18 ,,	,,	,,
,, . .	,,	24 ,,	,,	,,
,, . .	,,	48 ,,	,,	,,
,, . .	,,	72 ,,	very slightly damaged	,,
,, . .	,,	96 ,,	,,	,,
Creol . .	4 per cent.	18 ,,	slightly damaged	,,
,, . .	,,	24 ,,	damaged	,,
,, . .	,,	48 ,,	badly damaged	,,
,, . .	,,	72 ,,	,,	,,
,, . .	,,	96 ,,	,,	,,
Creol . .	6 per cent.	18 ,,	,,	,,
,, . .	,,	24 ,,	,,	,,
,, . .	,,	48 ,,	,,	,,
,, . .	,,	72 ,,	bulbs killed	,,
,, . .	,,	96 ,,	,,	,,
Copper sulphate	5 per cent.	18 ,,	badly damaged	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Copper sulphate	7½ per cent.	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Copper sulphate	$7\frac{1}{2}$ per cent.	72 hrs.	badly damaged	live eelworms found
,,	,,	96 ,,	,,	,,
Copper sulphate	10 per cent.	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Formalin . .	5 per cent.	18 ,,	growth retarded and dwarfed	,,
,, . .	,,	24 ,,	,,	,,
,, . .	,,	48 ,,	,,	,,
,, . .	,,	72 ,,	damaged	,,
,, . .	,,	96 ,,	,,	,,
Formalin . .	10 per cent.	18 ,,	growth retarded and dwarfed	,,
,, . .	,,	24 ,,	,,	,,
,, . .	,,	48 ,,	damaged	,,
,, . .	,,	72 ,,	,,	,,
,, . .	,,	96 ,,	badly damaged	,,
Lead chromate	1 per cent.	18 ,,	no injurious effect	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Poisonous Eelworm Destroyer	1 part in 80 of water	18 ,,	no injurious effect	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Poisonous Eelworm Destroyer	1 part in 50 of water	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Non-poisonous Eelworm Destroyer	1 part in 80 of water	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Non-poisonous Eelworm Destroyer	1 part in 50 of water	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	growth slightly retarded	,,
,,	,,	96 ,,	,,	,,
Carbolic acid .	1 per cent.	18 ,,	no injurious effect	,,
,, .	,,	24 ,,	,,	,,
,, .	,,	48 ,,	,,	,,
,, .	,,	72 ,,	very slightly damaged	,,
,, .	,,	96 ,,	damaged	,,
Carbolic acid .	2 per cent.	18 ,,	no injurious effect	,,
,, .	,,	24 ,,	,,	,,
,, .	,,	48 ,,	very slightly damaged	,,

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Carbolic acid .	2 per cent.	72 hrs.	damaged	live eelworms found
,,	,,	96 ,,	badly damaged	,,
Potassium sulphide	¼ per cent.	18 ,,	no injurious effect	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Potassium sulphide	½ per cent.	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Potassium sulphide	1 per cent.	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	very slightly damaged	,,
Potassium sulphide	3 per cent.	18 ,,	no injurious effect	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	very slightly damaged	,,
,,	,,	72 ,,	damaged	,,
,,	,,	96 ,,	badly damaged	,,
Ammoniacal copper carbonate	—	18 ,,	no injurious effect	,,
,,	—	24 ,,	,,	,,
,,	—	48 ,,	,,	,,
,,	—	72 ,,	,,	,,
,,	—	96 ,,	very slightly damaged	,, ,,
Ammoniacal copper carbonate	double strength	18 ,,	no injurious effect	,,
,,	,,	24 ,,	very slightly damaged	,, ,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	damaged	,,
,,	,,	96 ,,	badly damaged	,,
Mercuric bichloride	¼ per cent.	18 ,,	no injurious effect	,,
,,	,,	24 ,,	very slightly damaged	,,
,,	,,	48 ,,	slightly damaged	,,
,,	,,	72 ,,	damaged	,,
,,	,,	96 ,,	badly damaged	,,
Mercuric bichloride	½ per cent.	18 ,,	slightly damaged	,,
,,	,,	24 ,,	damaged	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	badly damaged	,,
,,	,,	96 ,,	,,	,,
Mercuric bichloride	1 per cent.	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Ammonia .	1 per cent.	18 ,,	no injurious effect	,,

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Ammonia .	1 per cent.	24 hrs.	no injurious effect	live eelworms found
" . .	"	48 "	"	"
" . .	"	72 "	"	"
" . .	"	96 "	"	"
Ammonia .	2½ per cent.	18 "	growth slightly retarded	"
" . .	"	24 "	"	"
" . .	"	48 "	"	"
" . .	"	72 "	"	"
" . .	"	96 "	very slightly damaged	"
Ammonia .	5 per cent.	18 "	growth retarded	"
" . .	"	24 "	slightly damaged	"
" . .	"	48 "	"	"
" . .	"	72 "	damaged	"
" . .	"	96 "	"	"
Nicotine . .	1 per cent.	18 "	no injurious effect	"
" . .	"	24 "	"	"
" . .	"	48 "	"	"
" . .	"	72 "	"	"
" . .	"	96 "	"	"
Soft soap and sulphur	—	18 "	"	"
"	—	24 "	"	"
"	—	48 "	"	"
"	—	72 "	"	"
"	—	96 "	"	"
Potassium permanganate	0·033 p.c.	18 hrs.	no injurious effect: growth slightly accelerated	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium permanganate	0·125 p.c.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium permanganate	¼ per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium permanganate	½ per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium hydrate	1 per cent.	18 "	no injurious effect	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Hydrochloric acid	1 per cent.	18 "	"	"
"	"	24 "	very slightly damaged	" "
"	"	48 "	"	"

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Hydrochloric acid	1 per cent.	72 hrs.	slightly damaged	live eelworms found
"	"	96 "	damaged	"
Nitric acid	1 per cent.	18 "	no injurious effect	
"	"	24 "	very slightly damaged	"
"	"	48 "	slightly damaged	"
"	"	72 "	damaged	"
"	"	96 "	"	"
Sulphuric acid	1 per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	badly damaged	"
"	"	72 "	very badly damaged	"
"	"	96 "	bulbs killed	"
Chromic acid .	½ per cent.	18 "	growth dwarfed	"
" .	"	24 "	"	"
" .	"	48 "	"	"
" .	"	72 "	slightly damaged	"
" .	"	96 "	"	"
Potassium bi-chromate	1 per cent.	18 "	growth dwarfed	"
"	"	24 "	very slightly damaged	"
"	"	48 "	"	"
"	"	72 "	damaged	"
"	"	96 "	badly damaged	"

The experiments were duplicated in Lincolnshire and in all cases the results coincided with those obtained at Wisley.

To test the extent a solution was capable of penetrating the bulb, a 1 per cent. solution of eosin was employed in which the bulbs were soaked. On examining the bulbs at intervals of 18, 24, 48, 72, and 96 hours respectively it was observed that the solution had not even passed through the outer scales of the bulb, whereas the base had absorbed the liquid fairly readily. We are thus able to account for the damage caused to the healthy bulbs by such solutions as copper sulphate, mercuric bichloride, &c. The solution gained an entrance *via* the basal plate, the tissue of which had been so injured as to prevent healthy root growth. All the bulbs on which the solutions had acted injuriously had failed to produce sufficient roots and in some cases no roots were emitted. While it was possible to kill a healthy bulb by soaking in a chemical solution, live eelworms were to be found inside a diseased bulb treated in the same manner. The percentage of eelworms killed by the soaking was not considered, because untreated diseased bulbs always contain a number of dead eelworms. In treated diseased bulbs the question would arise as to how many of the dead eelworms were killed by the solution, and how many had died a natural death. The fact that live eelworms were found in a treated diseased bulb suffices to show that the treatment was inadequate.

In no case was soaking in cold solutions of chemicals of any avail, and no recommendation as to their use can be made.

The Effect of Treating Bulbs with Poisonous Gases.

Healthy and diseased bulbs were fumigated in air-tight chambers with toluol, carbon-bisulphide, formaldehyde (the gas being generated by the action of potassium permanganate on commercial formalin), hydrocyanic acid, naphthalene, and nicotine. The results are set forth in Table III.

TABLE III.—THE EFFECT OF FUMIGATING HEALTHY AND DISEASED BULBS.

Gas.	Length of Fumigation.	Effect on Growth of Healthy Bulbs.	Condition of Eelworms in Bulbs.
Naphthalene . .	1 day	no injurious effect	eelworms found alive
" . .	2 days	" "	" " "
" . .	4 "	" "	" " "
" . .	7 "	" "	" " "
Formalin . . .	1 day	" "	" " "
" . . .	2 days	" "	" " "
" . . .	4 "	" "	" " "
" . . .	7 "	" "	" " "
Toluol . . .	1 day	" "	" " "
" . . .	2 days	" "	" " "
" . . .	4 "	" "	" " "
" . . .	7 "	" "	" " "
Carbon-bisulphide .	1 day	" "	" " "
" .	2 days	" "	" " "
" .	4 "	" "	" " "
" .	7 "	" "	" " "
Nicotine . . .	1 day	" "	" " "
" . . .	2 days	" "	" " "
" . . .	4 "	" "	" " "
" . . .	7 "	" "	" " "
Hydrocyanic acid .	1 day	" "	" " "
" .	2 days	slightly damaged	" " "
" .	4 "	damaged	" " "
" .	7 "	badly damaged	" " "

Fumigation appears to be of no use in killing the eelworms in affected bulbs, and it is probable that the bulbs offer the same resistance to the entrance of gases as they do to the admission of solutions.

Effect of Heat on Eelworms.

Experiments were conducted with the Reichert Thermal Stage, by means of which apparatus it is possible to maintain a constant temperature during examination under the microscope. The eelworms, isolated from diseased bulbs, were placed in direct contact with the warm stage. The results are shown in Table IV. on page 73.

The ease with which eelworms could be killed by direct heat led the writer to believe that soaking the bulbs in warm water might lead to a possible means of control.

Reference has already been made to work carried out by Mr. HEWITT and Mr. BARR on the soaking of bulbs in warm water, and,

having regard to the result obtained by Mr. HEWITT that bulbs are killed by soaking for one hour at a temperature of 120° F., it was decided not to exceed this temperature. A preliminary experiment was conducted by soaking bulbs for one hour at a temperature of 110° F., and it was found that the eelworms in the centre of the bulbs were unaffected by this temperature.

The temperature of the centre of the bulb at the end of one hour was 9° F. below that of the water in which they were soaking. At

TABLE IV.—REICHERT THERMAL STAGE EXPERIMENTS.

Temperature.	Length of Time Eelworms Lived.
110–111° F.	45 minutes
119–120° F.	15 ,,
126–127° F.	11 ,,
128–129° F.	9 ,,
131–132° F.	9 ,,
135–136° F.	5 ,,

the end of four hours the centre of the bulb was the same temperature as the water.

It was decided to experiment with three ranges of temperature, viz. 110°–111° F., 114°–115° F., and 119°–120° F.; both healthy and diseased bulbs were given the same treatment and were allowed to remain soaking for 1, 2, and 4 hours. The temperature was regulated by means of a thermostat, and the vessels containing the bulbs were immersed in an outer bath of water. The results of these experiments are as follow:

TABLE V.—EFFECT OF SOAKING BULBS IN WARM WATER.

Temperature of Water.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
110°–111° F.	1	no injurious effect	live eelworms found
110°–111° F.	2	very slightly retarded	an occasional eelworm found alive
110°–111° F.	4	slightly retarded	no eelworms found alive
114°–115° F.	1	badly damaged	live eelworms found
114°–115° F.	2	bulbs killed	no eelworms found alive
114°–115° F.	4	,,	,, ,,
119°–120° F.	1	,,	,, ,,
119°–120° F.	2	,,	,, ,,
119°–120° F.	4	,,	,, ,,

From these experiments it appears that a very high temperature is not necessary in order to kill the eelworms in affected bulbs. The bulbs, also, are readily damaged by heat or their growth retarded.

It appears that soaking the bulbs for a period of from 2 to 4 hours at a temperature of 110° F. affords the best method of controlling the eelworms in affected bulbs. The effect of soaking healthy bulbs in water at this temperature for a period of from 2 to 4 hours

showed itself in slight retardation of growth, and the flowers opened four or five days later than untreated healthy bulbs. The treated healthy bulbs did not flower quite so freely as the untreated healthy bulbs, although the bulbs were of the same variety and of the same grade.

The soaking of bulbs in water at a temperature of 110° F. for a period of 2 to 4 hours offers many difficulties. The temperature of the water must remain constant and each bulb should receive the same treatment. In cases where the soaking must be performed on a large scale it cannot be recommended to immerse the bulbs in full sacks in tanks containing warm water, as it is evident that the bulbs situated in the centre of the sack will not receive the same treatment as those situated near the sides. Experiments on the soaking of bulbs in water at a constant temperature are to be carried out this season on a fairly extensive scale, with the hope of finding a suitable apparatus for the purpose.

Soaking of Bulbs in Warm Solutions of Chemicals.

In addition to the warm-water soaking experiments, bulbs were also treated with warm solutions of chemicals. The results are recorded in Table VI.

TABLE VI.—EFFECT OF SOAKING BULBS IN WARM CHEMICAL SOLUTIONS.

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
	p. cent.		hrs.		
Carbolic acid .	0·05	110°–111° F.	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eel-worm found alive
"	"	"	4	slightly retarded	no eelworms found alive
"	0·1	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eel- found alive
"	"	"	4	slightly retarded	no eelworms found alive
Potassium sulphate	0·05	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eel-worm found alive
"	"	"	4	slightly retarded	no eelworms found alive
"	0·1	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eel-worm found alive
"	"	"	4	slightly retarded	no eelworms found alive
Potassium sulphide	0·05	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eel-worm found alive
"	"	"	4	slightly retarded	no eelworms found alive

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
	p. cent.		hrs.		
Potassium sulphide	0·1	110°–111° F.	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
Potassium bichromate	0·05	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
,,	0·1	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
Potassium hydrate	0·05	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
,,	0·1	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
Potassium xanthogenate	0·05	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
,,	0·1	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
Potassium permanganate	0·05	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
,,	0·1	,,	1	no injurious effect	live eelworms found
,,	,,	,,	2	very slightly retarded	an occasional eelworm found alive
,,	,,	,,	4	slightly retarded	no eelworms found alive
Carbolic acid	0·05	114°–115° F.	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,		,,	4	,,	,,
,,	0·1	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
Potassium sulphate	0·05	,,	1	badly damaged	eelworms found alive

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
	p. cent.		hrs.		
Potassium sulphate	0·05	114°–115°F.	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
Potassium sulphide	0·05	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
Potassium bichromate	0·05	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
Potassium hydrate	0·05	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
Potassium xanthogenate	0·05	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
Potassium permanganate	0·05	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
,,	0·01	,,	1	badly damaged	eelworms found alive
,,	,,	,,	2	bulbs killed	no eelworms found alive
,,	,,	,,	4	,,	,,
Carbolic acid	0·05	119°–120° F.	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Carbolic acid	p. cent. 0·1	119°–120° F.	hrs. 1	bulbs killed	no eelworms found alive
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
Potassium sulphate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
Potassium sulphide	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
Potassium bichromate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
Potassium xanthogenate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
Potassium hydrate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
Potassium permanganate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,

The results obtained by soaking bulbs in warm solutions of chemicals appear to offer no advantage over soaking in warm water. It may, however, prove advisable to use a warm weak solution of carbolic acid as a soaking medium, as by this means the bulbs may become sufficiently disinfected to deter further eelworm attack.

Effects of Cold.

Many growers were of the opinion that the severe winter temperatures experienced this year would aid in reducing the eel-

worms. Diseased bulbs were left on the surface of the soil throughout the whole of the winter. The thermometer at Wisley registered as much as 37° of frost. The bulbs on being brought into the laboratory were examined and eelworms in an active state of life were found.

Planted diseased bulbs were lifted after being subjected to alternate freezing and thawing, and live eelworms were present in the bulbs.

Conclusion.

The preventive method which promises best results is that of soaking the bulbs for a period of from 2 to 4 hours in water at a constant temperature of 110° F., and, providing a suitable apparatus be found so that the bulbs may be given correct treatment, it will afford an economical means of combating the disease.

At the same time it must here be pointed out that this soaking will not prevent attack by eelworms present in the soil.

Other experiments are on foot this autumn, and the treatment of infected ground, and susceptibility of crops to attack, are phases of the subject which are under experiment.

A YEAR IN A GARDEN ON THE NORTH-WEST COAST OF ROSS-SHIRE.*

By Osgood Mackenzie, F.R.H.S.

March.

I returned from the South on March 3, to find all my treasures wonderfully well preserved from the effects of winter. January, I was told, was something awful up here in the way of hurricanes and floods, but there was next to no frost, so my tenderest exotics did not mind the weather in their snug corners. The only things I found dead were a small, and to me unknown, *Eucalyptus* of doubtful hardiness, which someone had sent me on trial, and a *Sutherlandia* from South Africa, which bloomed well in the autumn (something in the way of a *Clianthus*), but gave up before the winter really started.

I also lost, towards the spring, two of those new bright-coloured Leptospermums (*Nicholli* and *Chapmanii*), which, I believe, I killed by over-care and coddling, having covered them (as it was their first winter) with night-caps of thin scrim; but my experience is that covering does not always answer; in fact, more often than not, it does harm, as I found when I first started growing Eucalypti. Thus I have got off, so far, uncommonly well, unless April punishes me), or perhaps even May, by a sharp frost, which is particularly hurtful, especially to the soft young shoots of the earlier-starting Rhododendrons.

My winter-flowering Rhododendrons did great things as usual with us, and their beauty was such that people in London would hardly credit they could possibly have been grown out of doors in the North, and the masses of *R. Nobleanum* and *R. praecox*, and the branches of Andromedas and Hamamelis posted to us, made us all but forget it was winter! On March 3 I found the dear old *Narcissus scoticus* and *N. pallidus praecox*, and also *N. minimus*, expanded in considerable quantity; in fact, we always reckon on having them out here in February; and *N. cyclamineus* is never far behind them. The last is so dainty, and does so well, and spreads by seeding itself freely, as many of the Narcissi do here. I also found *Rhododendron Shiltoni* out on my arrival, and it is really almost exactly like one of its parents, the beautiful *R. Thomsoni*, only five to six weeks earlier, which I am told is due to its other parent being *R. barbatum*. Curiously, I have had no luck with the latter so far. It is one of the very few Rhododendrons which have rather gone against me.

R. ciliatum also started expanding in the end of February, and

* For a description of the garden and its situation see "Gardening in the Western Highlands," Journal R.H.S. (1908), xxxiv. p. 47.

what a gem it is, as it never fails, though it might not be quite hardy in a very severe climate.

The two newer varieties of *R. Nobleanum* (viz. *venustum* and *coccineum*) are so well worth growing, coming in just when the original kind is about over, and they are quite distinct, for, instead of being red, the one is a beautiful light rose, and the other a deep crimson. I have also a Continental variety, which has for some years been much used in the South for forcing, called 'Silberaad's Early,' starting pale rose and finishing up pure white, and it is quite successful, and very early out of doors here. I have also an *arboreum* full of bloom, whose name, alas, if it had any, I have lost, and the first of its blooms expanded about the 25th of March, and it has the rather unusual, but very useful, habit of flowering in the centre of the bush, instead of, in the ordinary way, on the outside tips, and thus it is protected from damage from frost or hail showers. Its flowers are a glorious crimson, in rosettes surrounded by the most beautiful long leaves; so handsome are its leaves that it would be almost worth growing for its foliage alone.

I came upon a new treasure in the way of a winter-flowerer, which to me gives it so much more value—viz. *R. mucronulatum*. It is, I am told, a southern and glorified form of *R. dauricum*, and I was much struck with it when I came across it blooming in the open at Kew in January, and certainly it was most striking; and, though it is not easily got, I have managed to procure two plants of it!

I have also got two plants of *R. moupinense*, which is low-growing and white-flowered, and blooms also in mid-winter.

April.

What a miserable month April has been! But, as there was no frost down here at sea-level, my plants flourished.

I really thought it was never going to change for the better, and even one or two faint, half-hearted calls from the cuckoo brought no relief, till one day, about the 26th, a hoopoe suddenly appeared here, bringing fine weather with it from somewhere (probably Algeria or Egypt), and since then the weather of the remaining days of April has been quite perfect. Flowering bulbs, which do extra well with me in April, and which I seldom see elsewhere, except on a very small scale, are the Erythroniums or American dog-tooth violets. Here they come up from self-sown seed in masses, even in the gravel walks, and are ivory white, bright yellow, crimson, mauve, and pink; they never fail, and are such a joy! I measured one to-day over eighteen inches high, with six big white blooms on the one stalk, and so large as to remind one of a miniature lily. And so are the big patches of the pale-blue *Anemone nemorosa Robinsoniana*, and another called 'Blue Bonnets,' which spread like weeds.

April produced so many gorgeous Rhododendrons here, but only one of the hybrids (which we usually call Waterer's) expanded in

April. Their seasons are May and June and into July, but even the very best of them hardly come up to the choicest of the newer species. I have had, for the last ten days or fortnight, some perfect marvels in the way of big, eight to nine feet high, *R. Thomsonii* bushes smothered from top to bottom with their dazzling blooms, and among them, as a contrast, a nice bush of *R. Falconeri,* with twenty-one perfect white blossoms, so tropical-looking, as if they could never be grown but under glass, and each truss about as big as a child's head. Also a tall *R. rubiginosum,* more like a spotted fancy Pelargonium out of a greenhouse—and who could believe it to be even a connexion of those grand varieties of *R. arboreum* which have bloomed all through April?—and especially one whose tally calls it a *Shilsoni* cross, but which is, I think, 'Gill's Triumph,' which really, without exaggerating, is, I should say, the most perfect example of a Rhododendron, both as regards shape, texture, and colour, I have ever seen. One of the most fascinating things in the way of Rhododendrons which April produced were some sprays of *R. campanulatum* brought in by my daughter, with large bright mauve, somewhat bell-shaped blooms; but the foliage was its strong point, the upper sides of its leaves being a glossy dark green, while the under sides were as if composed of dull orange velvet, and the contrasts between the mauve and the green and the old gold were something not to be forgotten! The pale-yellow Rhododendrons have also been striking towards the end of this month—viz. *R. campylocarpum, R. ambiguum,* and *R. triflorum.* The yellows, all told (if one does not include the deciduous varieties usually called Azaleas), are but a comparatively small group, but yellow, not being among the ordinary evergreen rhododendron colours, appeals to me, especially when contrasted with the deep plum-coloured blooms of *R. niveum* and the all but blue *R. Augustini,* all of which blossomed here in April.

In spite of these sad times, and in spite of great difficulties in the way of transport, I have got a nice lot of new things from my favourite nurseries in Ireland and Cornwall, which, if I live a few more years, I shall have such interest in watching; and among other things I have succeeded in wintering some plants of the glorious blue flowering plant *Myosotidium nobile* from the Chatham Isles, and am hoping to bloom it some day, if not this summer.

May.

May and June are perhaps the most difficult months to tackle in attempting to describe even a few of the best and most striking of the vast multitude of trees and shrubs which blossom during those two months. Quite early in the month I had the following beautiful and more or less uncommon shrubs just smothered in bloom, viz. *Ceanothus rigidus, Magnolia stellata, Drimys aromatica, Azara Gilliesii, Enkianthus campanulatus,* and *Osmanthus Delavayi.* The Azara is a healthy big bush of ten feet high, reminding me just a very little of

the Mimosas, which, sad to say, I have grown but have failed to bloom so far. The Azara blooms rather resemble the Mimosa in shape and in the manner in which they are attached to the branches, only they are of a full orange instead of a pale yellow; it is, indeed, a noble shrub, and so very superior to *A. microphylla*, which is better known.

Drimys aromatica is most charming with its crimson flower-stalks, and quite unlike any other flowering shrub I know, except that it bears a slight resemblance to its cousin, *D. Winteri*, which flowers here in July. Curiously, the homes of these near connexions are very far apart—viz. Tasmania and Chile! The others of the above-named hail from China, Japan, and California; and they all seem equally to approve of our West Coast climate and thrive to perfection.

Among May herbaceous plants for naturalizing in grass or in semi-wild places, let me commend the Trilliums and the white Fritillarias; neither of these increases or spreads itself quite to the extent, for instance, of some of the Narcissi, the various Wood Anemones, or the Snowdrops, but they do very well indeed here, and come up year after year and deserve every encouragement; and so do the giant white campanulate Scillas, and, in fact, all the tall Squills, whether blue, pink, or white, which come up so well under trees.

Since jotting down these notes ten days have passed, and we are getting towards the end of the month. A whole fresh lot of Rhododendrons have expanded, and I hardly know which to extol the most! Perhaps 'Loder's White' would have been given first prize by some judges, had it been possible to have the whole lot exhibited at a flower show; the bush was so perfect, and it almost gave one the idea of something which was not quite of this world, so ethereal was its loveliness. But others of this more modern type come very near it in excellence, such as 'Pink Pearl,' *Gauntletii*, 'George Hardy,' and *Manglesii*, &c., and I have an idea that they all have *Aucklandi* blood in them.

I have not yet succeeded in getting very good trusses of bloom off my *Aucklandii*, such as are produced in Cornwall, though some of the individual flowers were perfect, and I had only just enough of them this year to make me long for more, which will, no doubt, come in time, and all that is wanted is just a little patience. It certainly is the queen of the Rhododendron species.

I can thoroughly recommend the Southern United States Azalea, *Rhododendron Vaseyi*, it is so hardy, and, being deciduous, does not mind what the winter tempests or spring frosts are like, which is different from some of the evergreen Rhododendrons, with their long strap-like leaves, which get torn by the gales, so that they require very sheltered situations. *R. Vaseyi* varies in tint from white to pink.

Still more beautiful is one of the newer Rhododendrons from China—viz. *R. yunnanense*. My former description of *R. rubiginosum* might, in a way, apply also to it, in that its bloom reminds me a little of some very dainty fancy Pelargonium. It is a gem of the first water!

I need perhaps hardly mention *R. cinnabarinum*, and its sister *R. Roylei*, as they are well known, but they are both extra charming, and the latter is in shape and also in colour quite apart from other Rhododendrons, its blooms being of a weird buff and orange colour.

I think one is apt perhaps to tire a little of those perfectly symmetrical cones of bloom, such as are thought perfection in the hybrids from a florist's point of view; and, if so, I possess a Rhododendron of a very different style, gifted to me by M. DE VILMORIN, of Paris—viz. the new and as yet uncommon species from China, *R. chartophyllum*. It is snow-white, and has this peculiarity, and, I think, great merit about it, that the delicate pale-green young growths push up through the centres of the loose bunches of inflorescence, and this takes away all stiffness, and makes the trusses of bloom, from a little distance, look as if they were a most tasteful combination of green and white. I do not know any other Rhododendron with this quite peculiar and charming habit, and it is such a good doer here.

I will only mention one more plant—viz. the double *Azalea narcissiflora*. Why it has been given this ridiculous name I cannot imagine, as no part of it resembles a Narcissus in the slightest degree; but it is most telling, brilliant, and floriferous, in colour bright mauvy pink.

Against a south wall I have a Clianthus in full flower just now (I think it is better known as the lobster-claw plant). *Habrothamnus elegans* and *Teucrium fruticans* have also done well against the same wall, with slight protection, and are flowering profusely.

JUNE.

I rather meant to have started with the Crinodendrons and Embothriums, but feel impelled, first of all, to say something about a favourite tree of mine, the New Zealand *Aristotelia racemosa*. I have had it many years—indeed, I now quite forget how, or from whom, I got it originally; but it has always thriven here, and yesterday (the 1st of June), when admiring it from a little distance, it appeared to my old eyes as if it had a pink tinge all over it, and, lo and behold, when I reached it, it was a mass of inflorescence. Though the individual flowers were rather insignificant, they interested me immensely, as it never showed a sign of flowering before. This Aristotelia has every appearance of being deciduous, whereas it keeps on its large soft pale-green leaves throughout hardest frosts and snows, and it would be quite worth having a group of it near a home to cheat one into the belief in winter that it was June instead of January. I hear its wood is much used in New Zealand for making gunpowder.

My *Crinodendron Hookerianum* (or, to give it its correct name, *Tricuspidaria lanceolata*) I need not describe minutely, as I have done so more than once before. It is a grand shrub, and I am flattered by having been told that my big one is the finest in the British Isles; this is, however, I fancy, a fable, as I feel sure there

must be larger specimens in the South of Ireland, where the soil and climate are much better than ours up here. However, I will give its dimensions—viz. height 19 feet, and circumference about 45 feet, which is not bad for the northern Highlands! As to the blooms on it, it never before had quite so many, and it would be all but an impossibility to count them, as its branches are simply weighted down with the thousands of its crimson blooms.

Its white-bloomed half-sister (*T. dependens*), which is said by some to be hardier than *lanceolata*, I find rather tender. I have seen it in bloom under glass in the South, and thought it very inferior in every way to the red one.

And now for the pride of my heart, the Chilean Fire-bush! I flatter myself that there are very few, if any, other good specimens of the *Embothrium coccineum* in Scotland besides my own; at least, I have not come across them or heard of them. If anyone else, in the north, south, east, or west of the country, does grow them well, it would interest me very much indeed to hear how they managed to succeed with them. I find few trees easier to grow, and, by way of describing them, I may say that their branches are closely packed with what look rather like the most brilliant light-scarlet honeysuckle blooms. Very few, if any, trees that can be grown in Britain can in the least compare with the Embothriums, as I have seen them in Cornwall, 30 feet high; and, when the sun shines on them, it is a sight to rejoice the heart of any botanist.

I often wonder how little is known by the general public about that hardy June-flowering bulb, *Habranthus pratensis*, and how seldom it is grown. I have a small clump of it with three fine flowering stalks, the blooms just expanding, and I mean to go in for it on a larger scale. It is just a kind of Amaryllis, and as lavish with its glittering scarlet as the Fire-bush. I know a place in Norfolk where they grow it on quite a large scale, but the public are somewhat slow in taking up a new thing, though, in truth, this is far from new. It is warranted hardy!

I am almost shy of starting on Rhododendrons again, but, in case any of my readers might think of ordering a few of the newer hybrids, I would strongly recommend the following eight, viz.:—'Alice,' 'F. B. Hayes,' 'Doncaster,' 'Corona,' 'Mrs. Stirling,' 'Lady Grey Egerton,' 'Bagshot Ruby,' 'Loder's White'; and of Rhododendron species, *R. Ungerni* is very good, with such beautiful foliage, and such grand trusses of lovely soft pink, and *R. sutchuenense* is a real treasure also.

Before finishing with the June flowers, I cannot help just mentioning the great pleasure the giant flowers the lilies of the valley gave us this year. So often, when a wild flower is enlarged and improved by cultivation, it loses its original charm in some way, and often becomes more delicate and difficult to grow, but it is not so with the giant (Fortin's) Convallaria, as its beauty and fragrance seem only enhanced, and in the way of growth and spreading it almost equals the famous, or rather infamous, Bishop's weed!

July.

As the rose is called the queen of flowers, I think I will start this month with a description of the newer Chinese wild Roses. Some of them have given us such pleasure this summer. *Rosa Moyesii* is something quite out of the common, and its foliage and fruit are about as striking as its lovely blooms, and so are *R. Wilmottiana, R. Hugonis,* &c., and anyone keen on flowers should get them without further delay.

Perhaps my most striking July shrubs are *Abutilon vitifolium, Solanum crispum,* and *Olearia macrodonta.* I need not enlarge upon the very great merits of *Abutilon vitifolium* as a most beautiful flowering small tree. *Solanum crispum* will also grow into what might almost be called a tree. There is a variety of it called *autumnale,* which I got from Glasnevin Botanic Gardens, which is later, and perhaps a better thing, than the early summer flowering one; and its masses of lavender blooms (though rather reminding one of potato blossom) are, I think, most telling and attractive. It is such an easy thing to grow anywhere, and its flowering season lasts such a long time, which is a great merit in a flowering shrub.

The third most striking July tree (if I may so call it) is certainly *Olearia macrodonta.* I have three, which are already 15 feet high, and wide in proportion. To convince my readers how they show up when in bloom, I may mention that one of mine is now a most striking object from the opposite side of Loch Ewe, at a distance of about one and a half mile. Like my big Crinodendron, my Olearias are the largest specimens I have ever met with anywhere, and I know of no other flowering tree of such snowy whiteness, except perhaps the Exochordas, which I forgot to mention in my June notes, and for the benefit of my readers I should perhaps explain that I had never been able to bloom the beautiful pearl bushes till I got a tip from a friend to try a variety called *Exochorda macrantha,* which was a real success this year, though only planted two years ago.

To show how happy the New Zealand holly (*Olearia macrodonta*) is here, I should perhaps also mention that it has never failed to bloom most profusely every year, and that plenty of its self-sown seedlings come up all over the place.

In close proximity to my Olearias I have just now three other very striking shrubs in full bloom, viz.: *Rhododendron Keysii* from Bhotan, *Buddleia Colvillei* from Sikkim, and *Azalea calendulacea* from America. No one seeing *Rhododendron Keysii* for the first time (unless very well up in shrubs) would ever imagine it could possibly be a Rhododendron, its blooms being more like that scarlet and yellow greenhouse plant, the *Correa.* The Buddleia blooms are also quite different from, and very superior to, the ordinary class of Buddleias, being more like inverted foxgloves; it is perfectly hardy here, but I am not sure if it would stand a bad winter in inland or East Coast places in Scotland.

An especial favourite of mine is *Philesia buxifolia,* and it is flowering rather nicely in a small way just now, but I find it a very slow grower, and do not get on with it as I would wish to. I saw it doing so much better at Abbotsbury in Dorsetshire. It is quite unique, and I believe it only has one other relative in this wide world which at all resembles it—viz. the *Lapageria rosea,* but the former is a dwarf shrub, whereas the latter is a tall climber, though the blooms are all but identical in form and colour.

I will finish July with *Grevillea sulphurea,* a rather striking Australian plant, with queer yellow flowers, differently shaped from any I have ever come across. It does quite well here, and I had a red one also, *Grevillea rosmarinifolia,* but I fear I killed it by shifting it.

August.

This being a late year, it is the month for most of the Veronicas, Philadelphuses, and Spiraeas, though some of them were in bloom at the end of July.

In a hard winter all Veronicas are not quite hardy here, but most of them are, and they make a fine and lasting show. I would not part with my great bushes of the sweet-smelling white *Veronica salicifolia,* and the blue *Veronica Andersoni,* or the deep-claret one (whose name I have lost), for anything, and knowing that is, I suppose, the reason for their trying to please me by seeding themselves in thousands; but when *salicifolia* comes up like mustard and cress in my gravel walks, then I cry, Enough!

How I wonder that people stick to the one old original Philadelphus (which it pleases them to call *Syringa*), and which one sees everywhere, while there are a dozen or twenty so very much more charming varieties (mostly raised by Lemoine of Nancy) which can be got nowadays at any good nursery. I know of no shrubs that perfume the whole air, even for a considerable distance, like some of these newer Philadelphus, and I fancy their exquisite perfume comes from their having been crossed with the small-flowered and lower-growing *Philadelphus microphyllus.* I have a lot of varieties; Philadelphus 'Virginal' is grand, and some big double ones almost like Guelder Roses are most striking.

Lemoine has also done such wonders of late years for the Lilacs, the Deutzias, and the Diervillas, which he has turned into something quite superior and quite different from the original kinds on which he started. But these are not my grandest August shrubs by any means, and I should perhaps have begun with the Buddleias, the Plagianthus, and the Desfontaineas. *Buddleia magnifica, B. superba,* and *B. Veitchiana* are quite a different lot from *B. Colvillei* or *B. globosa,* and most people say they should be pruned in close every year, but I have left some to grow into trees, just as they like, and where there is room I think they look magnificent. I have one big one just now which could fairly compete with my famous

Crinodendrons and Embothriums. Their one fault is that they last so short a time in bloom. A most choice and charming flowering tree is the New Zealand *Plagianthus Lyalli*, and it is a splendid doer here, and when in bloom in August reminds one of the cherry blossom in May, only its growth and foliage are more artistic than that of the cherry; it is a real treasure for the arboretum. But for brilliant colour in August commend me to the Desfontaineas, and when one has a Desfontainea bush, as I have here, all scarlet and orange, under a Plagianthus in full flower, the combination is perfection. Desfontaineas grow only too well here, and, as with my Japanese maples, I have to use the saw and the knife to them to keep them within bounds.

Among the many things I wonder at, one is that people never seem to have arrived at the fact that the Agapanthus is just an extra good hardy perennial on this West Coast; and what a show they make in the gardens, as well as out in the shrubberies here, with their heads of blue, and some of them white also! I see my clumps are sending up as many as twelve and thirteen flowering stalks, and they have one great merit, that no amount of wind and rain affects them adversely, and they stand all the frost we get, right out in the open, without any kind of protection.

The brilliant Antholizas, the lovely white Watsonias, and the tall *Dierama pulcherrimum* are equally grand South African plants that love our climate; and what a sight the latter (which are often called wand-flowers) were last year, waving their graceful heads about at Monreith in Galloway and Arduaine in Argyll, and they look so well here and elsewhere overhanging a pond or burn!

I ought to have mentioned in my July notes the Leptospermums. They are about the latest things out in flowering shrubs, and are really very fascinating. Some new plants which I got this year flowered profusely, and we all lost our hearts to them, as they are quite different from anything else I know. I fancy they are just sports from the common manuka (*Leptospermum scoparium*), which, I am told, is as plentiful in New Zealand as heather is in Scotland. The following three varieties are the new brilliantly coloured ones—viz. *Boscawenii*, *Chapmanii*, and *Nichollii*. *L. lanigerum* is also a fine shrub, and does first-rate here.

September.

There can be no doubt that the *Eucryphia* is the very best flowering shrub in September. I have only just started *Eucryphia cordifolia*, and so cannot say anything about it, but *Eucryphia pinnatifolia* I have grown for years, and my examples of it are already quite among my show shrubs, and look as if they could very soon be described as trees. I do not know any shrub that I can more highly recommend to everyone as being so thoroughly hardy and such a good doer, and never sick or sorry whatever the seasons may be like. They

are most floriferous, and their bloom is so lovely. I think I described it once before as being a little like sprays of the white dog-rose, with this difference, that there is a faint greenish tinge at the base of the petals; in fact, the centre of the flower is very pale green, which shows up more forcibly the lovely and prominent anthers which, instead of being yellow as in the dog-rose, are crimson. The Eucryphia has two other merits over our native dog-rose—viz. that its foliage is evergreen and that as a cut flower it lasts extra well in water. Some people liken it to a white St. John's Wort.

September is sometimes a good time here for the Cistuses, though usually August is their best time. They only do fairly well with me, and I grow *Cistus purpureus*, crimson with deep-red blotches; *C. ladaniferus*, white with the dark-chocolate blotch; and *C. crispus*, bright pink all over; but they do better, I think, for instance, on the coast of Norfolk on chalk, and with a hotter sun, and there they can almost compete with Rhododendrons in the size of their bushes. I believe if I planted them on lime rubbish in the hottest exposure I could find, instead of in my peaty stuff (which suits most things so well), and planted them also where there are no trees to shade them, they would do better.

My Romneyas (Californian poppies) have done really grandly this year. They did not thrive quite so well against a hot terrace wall in my kitchen-garden, but in one of my shrubberies they have been a real success, though not equal to some I saw at Craignish in Argyll, and I mean to try the new *Romneya trichocalyx*, which is said to be a still better doer. My Mitrarias were late this year, and did not flower as much as usual, though even a few of their vivid scarlet blossoms, in shape like a bishop's mitre, are always a joy to look at. I am told in some famous garden in the Mull of Galloway they grow hedges of Mitraria, but I have not yet reached that pitch of perfection, and meanwhile have to content myself with a hedge of *Phygelius capensis*, which, I think, is rather uncommon, and of which I am not a little proud, and I can thoroughly recommend it for the West Coast as a hedge plant. It is now full of its long crimson spikes, reminding one almost of stiff, stick-up Pentstemons, and will carry on all through October and November. It does not seem very well known in Scotland; why, I cannot think. The first time I saw it was covering the gable of a house on the Lago Maggiore, and I little thought then I could grow it equally well here!

I grow the tall St. John's Wort, *Hypericum Hookerianum*, in clumps among my shrubs, and with the help of the Spanish broom they give a golden glitter in September to places which might otherwise be getting rather colourless.

And now I will finish up September with a short description of what I consider to be a beautiful subject for a shrubbery, though more like an herbaceous plant than a shrub. Its name is *Coriaria terminalis*, and like many other Sikkim plants it thrives here. Its beauty consists in its fruit, and not in its flowers. Let those who

do not know it imagine spikes nine and ten inches long, encrusted with its fruit all round, like maize on its cob, only not nearly so stiff and clumsy as Indian corn, and the fruits are set close together on the spike, and are very like big, transparent white currants. It spreads here, and is thoroughly at home, and everyone who sees it falls in love with it.

October.

We have had such a spell of terrible weather during the middle of this month that only flowering shrubs such as the Hydrangeas and Myrtles could have stood it. The black-stemmed Hydrangeas with the very blue flowers have been, if possible, better than ever; and as to the paniculate Hydrangeas, they are among the very choicest blooming shrubs ever discovered; no equinoctial hurricanes or floods (even if accompanied by sleet and hail) seem capable of injuring them. I find (as with the Buddleias) there are two ways of growing them—*i.e.* either in a border with rich soil and close pruning in annually, under which system they remain low but produce huge heads of bloom, or, on the other hand, to grow them more or less naturally in the shelter of woods, allowing them to spread and shoot up tall, with next to no pruning, and though the individual blooms may be somewhat smaller, they make a most delightful show all through October and most of November. They have just one drawback, for which we have not yet found a remedy—viz. their inability to last long fresh in water when cut and brought into the house.

The next plants I find best for blooming in October are those well-known, lovely lilies, *Lilium auratum* and *L. speciosum.* They generally do so well in peaty Rhododendron and Azalea beds, and some of the former reached the height of between seven and eight feet this year. A big vase of these lilies in a room in October cannot be beaten for perfection of beauty by any other flowers grown during the whole rest of the year—for, besides their glorious colours of white and gold, pink and deep crimson, their perfume is so delicious.

Abelia grandiflora is a nice pink October-flowering shrub, and does quite well here, but I saw it flowering much more profusely against a hot terrace-wall in Argyllshire. *Diplacus glutinosus* is now producing its coppery orange blooms, which so exactly resemble the ordinary herbaceous monkey-plant. It is, in fact, just a Californian tree *Mimulus*, but I cannot boast of its being really hardy, as, like a lovely South African *Epacris*, which I sometimes bloom in a small way, it requires a little protection, which usually consists of a hand-glass with half its panes missing!

Next to my Hydrangeas, my most striking big shrubs blooming this month are undoubtedly the Myrtles. I have two kinds—viz. the old-fashioned very fragrant European one, usually grown indoors in pots in the colder districts, but which blooms so late here, even on a south wall, that in a cold year like this it can hardly be said to flower at all; and a vigorous, very hardy kind from Chile, which I got off

the big myrtle of Craignish, and which never fails to be white with blossom all September, October, November, and even December. Some would call it a *Eugenia*, but its most up-to-date name is, I think, *Myrtus Luma*. It is a really grand and most satisfactory shrub.

The autumn-flowering Cyclamens (viz. *Cyclamen hederaefolium*) are flowering rather nicely just now, as their cousins, *C. europaeum*, did in July; but I have never had what I could call real success here with Cyclamens, and they are among that small list of plants which I persevere with, but which never seem quite happy, and so different from what I have seen in Cornwall, where their leaves cover the ground under giant *Pinus insignis* trees, just like ivy. I am convinced it is the soil and not the climate which partially offends them, and perhaps if I give them soil which has no peat, and plenty of old lime rubbish, they may do better. I noticed in Palestine that *Cyclamen persicum* throve to perfection in holes and chinks in pure limestone rocks, and what a sight they were in Galilee in early March!

Just to show what a cold late season this has been, my *Clerodendron trichotomum* has all but failed to flower, though further south I saw it doing better; and *Eryngium pandanifolium*, with which I will finish up October, is also behindhand. The latter is certainly a very striking object for a lawn or shrubbery. It comes from far, far away—viz. the Chatham Islands, 500 miles east of New Zealand—and in an ordinary year with me it just manages (more or less) to perfect its steely-blue sea-thistly flowers towards the very end of October. What a magnificent clump I saw of it at Craignish lately, with a big sheaf of blooming stalks ten feet high!—and I can thoroughly recommend it for a sub-tropical nook, among Phormiums, Cordylines, Eucalypti, Paulownias, Mimosas, Abutilons, Chamaerops palms, tree-ferns, and even *Musa Basjoo* (the hardy banana), all of which can be grown without protection on this West Coast. The only one of the lot which I have not got is the Musa, and I am getting it.

NOVEMBER.

No frost as yet (November 25) at sea-level, though there has been a degree or two inland, and consequently we can still, in November, produce specimens of most of the well-known flowers grown in British gardens, Dahlias, Begonias, Gladioli, Roses, and Mignonette, mixed up with some Primroses, Polyanthuses, and Violets, which are evidently mistaking November for February or March! How thankful I am that I live in a climate where the Fuchsias are at their best in November, and where the tall tropical-looking Mexican Brugmansias, with their handsome long pendent scarlet tubes, make one believe it is still hot weather, whereas it is really winter, though the thermometer goes up sometimes to 50 and even one day to 55; and this, together with the great blessing of having usually an early spring

here, makes the much-dreaded winters pass so easily and quickly; and how different it must be where in many Scottish and English homes the gardens are dreary deserts, the effect of some cruel frost in September!

If it were not for the abundance of other flowers, the second blooming of the big bushes of *Desfontainea spinosa* (which is now on) would be warmly applauded, but when the terrace walls are still orange and red with *Tropaeolum tuberosum* and *Phygelius capensis*, and blue with the most perfect Hydrangeas and Ceanothus, the Desfontaineas and *Myrtus Luma* in the shrubberies hardly get the admiration they so justly deserve; and then there is the autumn leaf-colouring, which is really almost more brilliant than even the flowers themselves. It has not been by any means a good season for autumn tints.

Whole woods of the native birches lost their leaves very early, falling in showers while still all but green; and the rowans, Norway maples, geans, and aspens did the very same. But there were some notable exceptions among the exotics, such as a nice big *Acer nikoense*, which turned a rather unusual lovely salmon tint; and *Disanthus cercidifolia*, the Gaylussacias, *Enkianthus japonicus*, and the Eucryphias were marvellously brilliant, and so were most of the Japanese maples, but their beauty was so short-lived, and some that used to turn vermilion only turned a reddish orange, owing, I fancy, to want of sun, and perhaps also want of slight frosts at night and there being far too much rain.

Although the shrubberies are now not so bright as they were, they are to me quite as interesting as ever. I am so proud of my comparatively small tree-ferns (the New Zealand Dicksonias), and this season seems to have suited them well. Of course they are a bit delicate, but they can generally be kept going by tying their own fronds in a bunch over their heads to keep the frost and snow from spoiling their crowns from which the coming year's fronds will start, and which seem to be their tender point. I cannot boast of my fronds being quite six feet long, though I saw some at Trewidden in Cornwall which, I think, were nearer twenty-five feet, grown at the bottom of deep holes, said to have been dug by the ancient Phœnicians when burrowing for tin.

I have several interesting new plants which are in course of being tried to test their hardiness here—viz. the *Guevina*, which has so far proved itself quite hardy at Arduaine in Argyllshire for the last two or three winters, and *Anopteris glandulosa*, which struck me as being the most charming new plant that I saw in all Cornwall two years ago, and I am interested also in several new Eucalypti, which promise well. One of them is *Eucalyptus Mölleri* from Tasmania, recommended to me by Professor Henry, of Dublin, and the other is *E. alpina* They are about as unlike each other as it is possible for trees of one tribe to be, the one with rather unusually big leaves, and the other just the contrary with very small leaves.

I am now growing about nine species of gum trees (as the Australians call them), and so far they are proving themselves quite hardy and satisfactory, and I think them most telling and picturesque in the woods, especially among conifers.

DECEMBER.

I quite forgot to say anything in my last month's notes about our most brilliant of November flowers, and as they are still very nearly at their best I may honestly describe them as plants flowering to perfection in winter. What I refer to is *Schizostylis coccinea* from Natal, and for the benefit of those who do not know them I will describe them as an elegant miniature, intensely scarlet Gladiolus, which, although they have been cultivated in Britain for many a long year, are not half so well known or half so much grown as they deserve to be. The Schizostylis would be much admired even if its flowering season were in June or July. How much more valuable is it therefore when flowering in winter, as it does here on this West Coast to such perfection! It simply seems to revel in our soil and climate, though I must confess that I have never known it do, even tolerably, anywhere on the East Coast.

We have to-day (December 11) got vases on the table of Schizostylis and Christmas Roses, and what a lovely contrast they are! though it is far easier to grow the former than the latter here. To show off the Schizostylis to perfection, one wants a cosy, warm dining-room, with the table all decorated with it, as ours is here, under electric light, and then their brilliancy is as marvellous as a bush of *Rhododendron Thomsoni* in bright April sunshine, which is about the most dazzling object I know of in the whole floral world.

I had also all but forgotten to say anything about my Bamboos, and as they are at their very best in mid-winter, December is surely the time to describe them. Visitors to my shrubberies often remark on their size and luxuriance, which does not perhaps strike me so much, being accustomed to seeing them so thriving in certain spots in Argyllshire. I grow a lot of varieties, and they nearly all do equally well. Perhaps the best doer is *Arundinaria anceps*, and a big mound of it is certainly a grand object. The other day a visitor, who was much struck by one of the clumps, made me stand alongside of it so as to judge its height, and he reckoned the canes to be fully twenty feet high, and all these tall shoots are the growth of one season—viz. a couple of months just during July and August.

I have also three grand climbers which I must not forget to praise, and two of them are especially adapted to climbing up the bare stems of trees, as they will do without the help of any wire netting. One of the first objects to attract the eye of any visitor to my shrubberies in December is that delightful Tasmanian climber, *Billardiera longifolia*, covered with large blue berries, climbing up a silver birch tree. It is not, I think, very commonly seen in North Britain, though it

grows and fruits so freely here. It requires wire netting to help it up, but I have two other more or less uncommon climbers, which run up the tree-stems without any help, and I can most strongly recommend them both to everyone. They are the climbing Hydrangea, commonly known by another awful name—viz. *Schizophragma hydrangeoides*, and the rather newer Chinese *Actinidia chinensis*. These three climbers are entirely different the one from the other, but each one has its own great merits.

The shrubberies do not look a bit wintry yet, as most of the New Zealand and Chilean shrubs and trees are evergreen, and even some of the deciduous trees, such as the Magnolias (and especially *Magnolia Campbelli*), are still in their summer dress, and one is only reminded of the actual lateness of the season by the early Narcissi and snowdrops showing up where the blackbirds have scratched their covering of leaves off them.

Next to the Schizostylis, the brightest objects in the garden are big clumps, four feet high, of *Fuchsia gracilis*. They are still nearly at their best, while our hedges of *Fuchsia Riccartoni*, and the large-flowered *Fuchsia globosa*, are quite over.

Another December flower struck me to-day as being very brilliant, and that was the intensely blue *Lithospermum prostratum*, which does so well here, and which often flowers nearly as freely in January as in June.

To show what our climate here is, I may finish up by mentioning that this is the 9th of December, and that there has not been as much as one degree of frost at Inverewe yet!

[The foregoing notes refer to the year 1916.—Ed.]

METEOROLOGICAL OBSERVATIONS AT WISLEY, 1916.

By R. H. Curtis, F.R.H.S.

The weather of 1916, regarded from a gardener's point of view, was by no means ideal. Taking a broad retrospect, it was cold and wet, with a marked deficiency of bright sunshine, and with more strong winds and gales than are usually experienced. The outstanding climatic features of the year are shown graphically in figs. 30–33; and especially in fig. 30, where the coolness of the two mid-summer months, June and July, is strikingly exhibited by the deep drop of the temperature line below the normal; whilst fig. 31 shows that in June the normal march of temperature was reversed, and the mean for the month was actually, as well as relatively, lower than that of May. Gales were most frequent in the early and late months of the year, but by far the most serious to horticulturists was that which occurred at the end of March, when over all the southern counties of England much damage was caused to trees, whose branches, already heavily weighted by clinging snow, were carried away by the violent squalls; or the tree was entirely up-rooted and destroyed. Fig. 30 also shows that whilst the year began with an unusual amount of warmth, the mean temperature in January having been more than six degrees *above* the normal, it closed with a nearly equal departure from the mean in the opposite direction, the December mean temperature being nearly six degrees *below* the normal. The figure also shows that the unusual wetness of the *year* was chiefly due to the excessive falls of rain in the second and third, and the tenth and eleventh months; the falls in the other eight months varied only by small amounts from their averages, and the mean for the whole eight was fairly normal.

The chief features of the weather of the several months were as follows:

January.—The year opened with a southerly to westerly gale, which blew for several hours with more than usual violence over the whole of the United Kingdom. This gale was the first of a series, all of which travelled slowly along an easterly path, well to the north of the British Isles, and caused an almost continuous succession of strong westerly winds, and with them a persistently high temperature, and the mildest January experienced over Great Britain for very many years. January is the mid-winter month, and generally the coldest month of the year; but on this occasion there was practically no winter; no snow fell, and the few frosts which occurred were slight and of brief duration. The result of this unusual warmth was very manifest in the Gardens, the spring flowers opening in an extraordinary way—early Rhododendrons, Anemones, Narcissi, Scillas, Saxifrages, Primroses, Violets, Snowdrops, Irises, and very many others, blooming quite early in

the month; indeed, the forward state of vegetation approximated closely to what is common in the extreme south-western parts of the

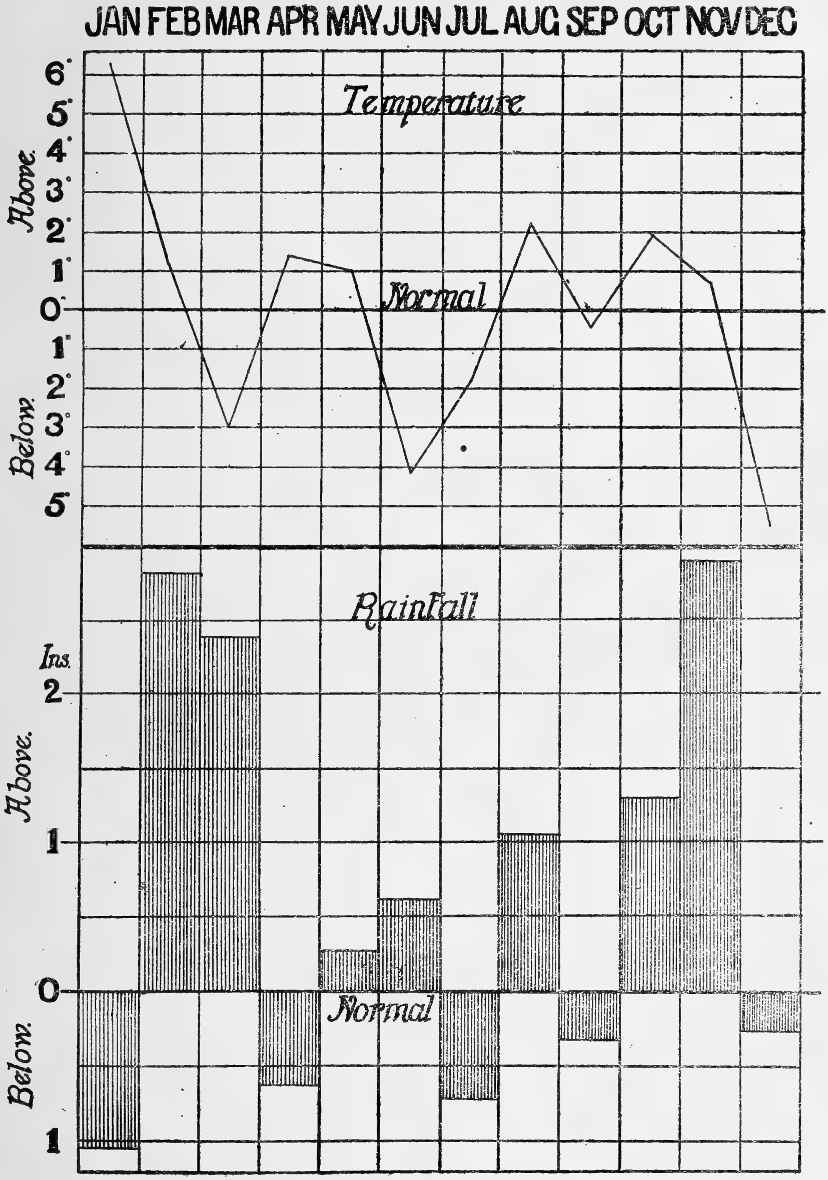

FIG. 30.—DIFFERENCES OF THE MONTHLY MEAN OF TEMPERATURE AND RAINFALL FROM THE AVERAGE.

kingdom, but is only very rarely experienced in the south-east. In the southern counties generally there was less rain than usual, and at Wisley the fall was less than half the average amount; but over the greater part of the eastern and midland counties also the rainfall was

small, and it was only in the north and north-west that any large falls occurred.

The results of the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	45·4°		
Highest ,, ,, ,,	56°	on the	1st
Lowest ,, ,, ,,	27°	,,	23rd
,, ,, on the grass	15°	,,	23rd
Number of nights of ground frost			13

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	43·8°	44·6°	45·4°
Highest ,, ,, ,,	47°	46°	46°
Lowest ,, ,, ,,	41°	44°	45°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 90 per cent.

Rain fell on 12 days, to the total depth of 0·78 in. (equivalent to about 3½ gallons of water to the square yard). Heaviest fall on any day 0·18 in., on the 2nd.

The prevailing winds were south-westerly.

The average velocity of the wind was 9 miles an hour.

There were 47 hours of bright sunshine, equal to 18 per cent. of the greatest possible amount.

There were 13 days on which no sunshine was recorded.

February.—In some respects the weather of the first half of this month resembled pretty closely that of its predecessor, and was both windy and mild, and, with the exception of one day of very heavy rain, it was not unusually wet. But in the latter half of the month a great change, with the development of quite another type of weather, was experienced. The mild westerly winds gave place to a cold current of air from the north and north-east, which brought with it frequent snow and cold rain, and a great fall in temperature, and made it impossible to carry on the usual out-of-door work in the Garden. The fall of snow was at times deep; and in many parts quite unusual drifts were formed, and continuing for many days they entirely buried everything of dwarf habit in the Garden. At Wisley the total precipitation for the month, which of course includes snow, was three times the average amount, and over a very large part of England it was double. In some exposed parts of south-west England the snowdrifts were reported as being from ten to twelve feet deep! The month was exceptionally dull, the average duration of bright sunshine at Wisley being but a little over two and a half hours a day, or one quarter of the possible amount.

The average values obtained from the daily observations made at the Observatory in the Garden are shown in the following table:

Mean temperature of the air in shade	39·2°		
Highest ,, ,, ,,	53°	on the	15th
Lowest ,, ,, ,,	22°	,,	25th
,, ,, on the grass	7°	,,	25th
Number of nights of ground frost			24

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	40·6°	42·7°	44·3°
Highest ,, ,, ,,	44·3°	44·7°	45·6°
Lowest ,, ,, ,,	36·5°	39·5°	42·5°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 20 days, to the total depth of 4·20 in. (equivalent to about 19½ gallons of water to the square yard). Heaviest fall on any day 0·93 in., on the 3rd.

The prevailing winds were northerly—from between north-west and north-east.

The average velocity of the wind was 9 miles an hour.

There were 79 hours of bright sunshine, equal to 27 per cent. of the greatest possible amount.

There were 7 days on which no sunshine was recorded.

March.—In some respects the weather of this month was very remarkable. It was unusually cold all over the kingdom; at Wisley the maximum temperature reached 50° on six occasions only, whilst the minimum fell below 40° nearly every day, and on the 9th it fell so low as 18°. It was also another very wet month, the rainfall being double the average, or even more, over all the southern and eastern counties of England; and at Greenwich it was the wettest March since rainfall observations were begun there in 1815. On the other hand, in some western portions of the kingdom, which are usually the wettest, the rainfall was only a quarter of the average amount. So far as the Garden at Wisley was concerned, this exceptional rainfall, combined with the cold, involved further delay in getting on with seasonable outdoor work, and very much hindered the growth of all spring flowers. Another feature of the weather was the absence of high winds until towards the close of the month, when gales followed each other in quick succession. One that occurred on the 27th–28th was accompanied by a heavy fall of snow, and did a vast amount of damage to trees and gardens over a very wide area. From Guernsey it was reported that nearly one hundred greenhouses had been completely wrecked; whilst at Windsor, Bushey Park, and Kew Gardens much damage was done to large trees.

The mean results yielded by the daily observations made at Wisley are as follows:

Mean temperature of the air in shade	39·4°		
Highest „ „ „	58·4°	on the	19th
Lowest „ „ „	18°	„	9th
„ „ on the grass	11°	„	9th
Number of nights of ground frost			22

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	39·5°	40·6°	41·8°
Highest „ „ „	44·1°	43·3°	42·7°
Lowest „ „ „	35·6°	38·1°	40·5°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 93 per cent.

Rain fell on 21 days, to the total depth of 4·57 in. (equivalent to about 21¼ gallons of water to the square yard). Heaviest fall on any day 0·96 in., on the 27th.

The prevailing winds were north-easterly.

The average velocity of the wind was 6 miles an hour.

There were 64 hours of bright sunshine, equal to 18 per cent. of the greatest possible amount.

There were 13 days on which no sunshine was recorded.

April.—The month opened with rather warmer weather than had been experienced for some time, although the nights were still cold for

the time of year, and some sharp ground-frosts occurred. Then ensued a spell of changeable weather, with lower day temperatures and more or less rain, but still with a record of sunshine on nearly every day, although sometimes only a very brief one. A very decided improvement then took place—a milder air current set in, the weather became quite dry, and the closing days of the month were warm and brilliant. Taking the month as a whole, it may be fairly described as sunny and warm, the mean temperature having been about half a degree above the average, whilst the amount of bright sunshine recorded was very nearly half the possible amount. The middle of the month was rather

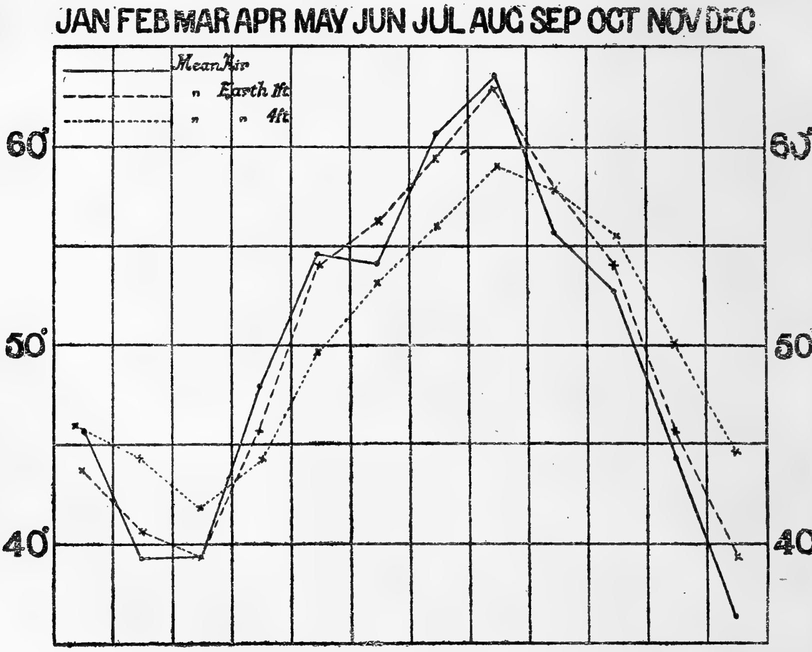

FIG. 31.—MEAN TEMPERATURE OF THE AIR, AND OF THE SOIL AT THE DEPTH OF ONE FOOT AND OF FOUR FEET BELOW THE SURFACE, FOR EACH MONTH.

windy, but there were no gales in the south-eastern portion of the kingdom, and nothing to retard garden work, so that the arrears due to the bad weather of the preceding months could be overtaken, and at the same time vegetation—and especially bulbs—made good progress.

The results of the daily observations made at the Meteorological Observatory in the Gardens are as follows:—

Mean temperature of the air in shade	48°		
Highest " " "	75°	on the	27th
Lowest " " "	30°	"	8th
" " on the grass	19°	"	8th
Number of nights of ground frost			16

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	45·7°	45·4°	44·3°
Highest " " "	52·7°	50·2°	46·9°
Lowest " " "	42·6°	42·7°	42·5°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 76 per cent.

Rain fell on 12 days, to the total depth of 0·98 in. (equivalent to about 4½ gallons of water to the square yard). Heaviest fall on any day 0·23 in., on the 19th.

The prevailing winds were northerly—from north-west to north-east.

The average velocity of the wind was 7 miles an hour.

There were 193 hours of bright sunshine, equal to 47 per cent. of the greatest possible amount.

There were no days on which sunshine was not recorded.

May.—Nearly the whole of the first half of this month was dull and sunless, and with the exception of one or two days of exceptional warmth, it was cool for the time of year. The second half, however, brought with it a marked change, and it was both drier and brighter, and very much warmer than usual, so much so, indeed, that, notwithstanding the cool first half, the mean temperature for the whole month was considerably above the average. On the 21st the shaded thermometer at the Gardens registered 80°, whilst in London 85° was recorded. The latter half of the month was also very dry over the whole of the eastern and south-eastern counties, but taking the month as a whole the fall of rain was more or less in excess of the average all over the kingdom. To this condition of things not only did vegetation quickly respond, but insect life also became very active, the eggs of some pests being hatched out at so great a rate as to play havoc with the foliage of nearly all deciduous trees. There were no frosts all through the month.

The mean results of the daily readings of the instruments at the Gardens are given in the following table:

Mean temperature of the air in shade	54·7°		
Highest " " "	80°	on the	21st
Lowest " " "	35°	"	27th
" " on the grass	24°	"	27th
Number of nights of ground frost			9

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	54·2°	49·8°	49·8°
Highest " " "	59°	56°	53°
Lowest " " "	49·5°	50°	47°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 76 per cent.

Rain fell on 11 days, to the total depth of 1·76 in. (equivalent to about 8¼ gallons of water to the square yard). Heaviest fall on any day 0·40 in., on the 12th.

The prevailing winds were westerly.

The average velocity of the wind was 5 miles an hour.

There were 195 hours of bright sunshine, equal to 41 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

June.—The weather of this month was altogether abnormal, and as regards temperature it is probably safe to say that so cold a June had not been experienced for at least three quarters of a century. All over England and Wales, and in parts of Scotland and Ireland, there was a great deficiency of bright sunshine, and in consequence a continued succession of low maximum temperatures day after day, and to this, perhaps more than to low night temperatures, the very low

mean temperature was due. At Wisley on the warmest day the temperature did not exceed 70°, and the mean of all the maxima throughout the month was only a little above 60°. The effect of this continued absence of warmth soon became apparent in the Garden: in one district the leaves of trees exposed to the north became withered, chestnuts became quite brown, and beeches looked as they usually do in autumn. At Wisley all vegetation was slow in growth; such things as peas did not fill well, and tomatos set indifferently, whilst mildew spread rapidly in rose beds. The rainfall at Wisley was less than the average, but in several parts of the kingdom it largely exceeded it, especially in the far north; speaking generally, however, the month was one of moderate wetness.

The results of the daily observations at Wisley are summarized in the following table:

Mean temperature of the air in shade	53·9°		
Highest ,, ,, ,,	70°	on the	24th
Lowest ,, ,, ,,	37°	,,	17th
,, ,, on the grass	27°	,,	3rd
Number of nights of ground frost			5

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	56·2°	55·3°	53·2°
Highest ,, ,, ,,	58·6°	56·8°	54·5°
Lowest ,, ,, ,,	53·8°	53·8°	52·7°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 77 per cent.

Rain fell on 16 days, to the total depth of 1·55 in. (equivalent to about 7¼ gallons of water to the square yard). Heaviest fall on any day 0·25 in., on the 4th.

The prevailing winds were south-westerly.

The average velocity of the wind was 5 miles an hour.

There were 151 hours of bright sunshine, equal to 31 per cent. of the greatest possible amount.

There was only 1 day on which no sunshine was recorded.

July.—The type of weather which had caused the cold and gloomy conditions of June persisted throughout the first half of July, and little or no improvement was shown throughout that period; but soon after the second half of the month had been entered upon a change took place, and very welcome warmer weather set in. The improvement was not general, however, all over the kingdom, and the eastern parts of England, and some other districts, were still waiting for summer conditions to show themselves. At Wisley the highest temperature occurred on the 29th, when 83° was reached; and for the first time in the year the month passed without a ground frost being recorded at the Gardens. The month was also a dry one over the kingdom generally, and at Wisley the fall of rain only reached half the normal amount. The record of bright sunshine was low everywhere, and at the Society's Gardens averaged only 5½ hours a day, or thirty-five per cent. of the possible amount; during the last three days this had increased to 13 hours a day. The effect of the warmer weather soon became apparent in the Gardens, and all the more so as vegetation had been checked for so long. Peas especially made extraordinary growth, and by the close of the month were two feet above their normal height.

During the last week, however, the heat and drought combined caused vegetation to suffer considerably.

The results of the daily meteorological observations are summarized in the following table:

Mean temperature of the air in shade	60·3°	
Highest „ „ „	83°	on the 30th
Lowest „ „ „	41°	„ 2nd
„ „ on the grass	35°	„ 15th
Number of nights of ground frost		None

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	59·7°	58·3°	55·8°
Highest „ „ „	63°	61°	58°
Lowest „ „ „	58°	57°	55°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 78 per cent.

Rain fell on 8 days, to the total depth of 0·80 in. (equivalent to about 3¾ gallons of water to the square yard). Heaviest fall on any day 0·34 in., on the 6th.

The prevailing winds were from between south-west and north-west.

The average velocity of the wind was 4 miles an hour.

There were 171 hours of bright sunshine, equal to 35 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

August.—The dry weather of the latter part of July was prolonged throughout the first half of August, by which time rain had everywhere become badly needed, since there had been a continuous succession of bright, hot days, on many of which the temperature had exceeded 80°, lasting for nearly four weeks. This drought was now followed by a spell of unsettled rainy weather, lasting till the close of the month, by which time the fall of rain had everywhere exceeded the usual amount for the entire month, and in some districts the excess was very considerable. Quite at the close of the month there was a very heavy and prolonged downpour over a great part of south-western England, which resulted in falls of between three and four inches in less than twenty-four hours. The temperature during this latter half of August, notwithstanding the rain, differed very little from the normal, so that, taking the entire month, the mean temperature was two degrees in excess of the average; and regarding its weather generally, from a gardener's point of view, it was a very satisfactory month.

The observations made at the climatological station at Wisley give the following results:

Mean temperature of the air in shade	63·4°	
Highest „ „ „	83·4°	on the 1st
Lowest „ „ „	44·1°	„ 31st
Lowest „ on the grass	35·2°	„ 5th
Number of nights of ground frost		none

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	62·8°	61·7	59·2°
Highest „ „ „	65°	63°	60°
Lowest „ „ „	59°	61°	58°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 78 per cent.

Rain fell on 15 days, to the total depth of 3·23 in. (equivalent to about 15

gallons of water to the square yard). Heaviest fall on any day 0·79 in., on the 29th.

The prevailing winds were south-westerly and north-easterly.

The average velocity of the wind was 4 miles an hour.

There were 184 hours of bright sunshine, equal to 41 per cent. of the greatest possible amount.

There was 1 day on which no sunshine was recorded.

September.—The weather throughout this month was generally quiet, with a nearly normal temperature, and rather less than the

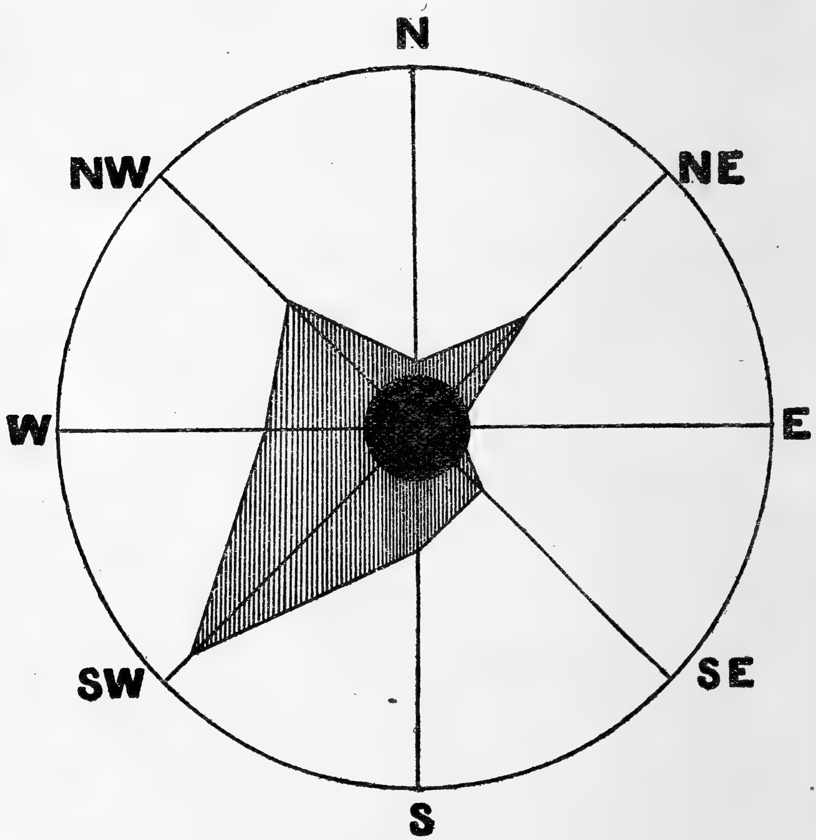

FIG. 32.—DISTRIBUTION OF WINDS DURING THE YEAR. THE RELATIVE FREQUENCY OF CALMS IS SHOWN BY THE SHADED CIRCLE IN THE CENTRE.

usual amount of rain, but with a marked deficiency of bright sunshine, so that it may fairly be described as dry but dull. Nowhere was there any prolonged spell of sunny weather, and at the Gardens the average daily deficiency amounted to nearly two hours. On the other hand, there were no sharp autumnal ground frosts, such as frequently occur in September, although on two or three occasions slight ones were recorded; and in consequence right up to the close of the month a quite extraordinary growth of vegetables was maintained, whilst fruit buds rapidly swelled, trees and shrubs maintained their greenness

and freshness in a quite remarkable degree, and roses continued to bloom freely.

The results obtained from the meteorological instruments at the Observatory in the Garden are as follows:

Mean temperature of the air in shade	55·8°	
Highest ,, ,, ,,	71·6°	on the 25th
Lowest ,, ,, ,,	33·5°	,, 22nd
,, ,, on the grass	28°	,, 15th
Number of nights of ground frost		6

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	57·7°	58·3°	57·8°
Highest ,, ,, ,,	61°	61°	59·5°
Lowest ,, ,, ,,	54°	56°	56°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 87 per cent.

Rain fell on 13 days, to the total depth of 1·46 in. (equivalent to nearly 7 gallons of water to the square yard). Heaviest fall on any day 0·35 in., on the 1st.

The prevailing winds were north-easterly and north-westerly.

The average velocity of the wind was 4 miles an hour.

There were 105 hours of bright sunshine, equal to 28 per cent. of the greatest possible amount.

There were 2 days on which no sunshine was recorded.

October.—With the commencement of this month the weather underwent a complete change in its character, and the generally quiet conditions which had prevailed right through the summer gave place to weather of a stormy and unsettled type, which continued with but little intermission until its close. As regards temperature, the first half of the month was unusually warm, the daily maximum at the Gardens being between 60° and 70° throughout, whilst the night temperatures were also abnormally high, and on many nights fell very little below 60°, so that the weather was uniformly mild throughout the twenty-four hours. On the 15th, however, a complete change took place, and the southerly winds which had caused these quiet conditions gave place to strong currents of a different type, that brought with them an abrupt fall of temperature, and occasional ground frosts at night, by which such plants as Gunneras and Dahlias were killed, although, notwithstanding the cold, the foliage of trees maintained its colour, with scarcely any fall of leaves, right up to the end of the month. There was everywhere less sunshine than usual, but the deficiency was particularly marked in the western districts, where at this time of the year there is generally more sunshine than in other parts of the kingdom. At Wisley thirty per cent. of the possible amount was registered, but over Cornwall and Devon the percentage was in many places as low as twenty. Rainfall was everywhere in excess of the normal amount, and at Wisley the excess was nearly fifty per cent.; but the north-eastern and eastern counties of England were the only districts in which the fall was normal.

The results of the observations made at Wisley are as follows:

Mean temperature of the air in shade	52·7°	
Highest ,, ,, ,,	67°	on the 5th
Lowest ,, ,, ,,	27°	,, 21st
,, ,, on the grass	19°	,, 21st
Number of nights of ground frost		8

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	53·9°	54·9°	55·2°
Highest ,, ,, ,,	59°	58°	57°
Lowest ,, ,, ,,	48°	51°	52°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 22 days, to the total depth of 4·36 in. (equivalent to about 20½ gallons of water to the square yard). Heaviest fall on any day 0·60 in., on the 27th.

The prevailing winds were south-westerly.

The average velocity of the wind was 7 miles an hour.

There were 98 hours of bright sunshine, equal to 30 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

November.—This was an extremely wet and stormy month, there being an almost constant succession of gales, some of them of great violence, which kept the weather in a very unsettled state. The dominant winds were south-westerly, and they brought with them not only a heavy rainfall, but also a temperature generally in excess of the average, and at times some really warm days. Night-frosts, too, were fewer than is usual at this season, and as a result the leaves remained in quite a remarkable manner on all deciduous trees till the end of the month. In nearly every part of the kingdom the rainfall exceeded the normal for the month, but in some districts the excess was large; at the Wisley Gardens it was more than double the average, and the excessive wetness greatly hindered all outdoor operations; indeed, in nearly all parts of the country work on the land was greatly retarded, and in the Thames valley, where there were heavy floods following upon the downpours of the first week of the month, it was to a great extent stopped altogether.

The results yielded by the daily observations made at Wisley are as follows:

Mean temperature of the air in shade	44°	
Highest ,, ,, ,,	58°	on the 11th
Lowest ,, ,, ,,	25°	,, 28th
Lowest ,, on the grass	13°	,, 28th
Number of nights of ground frost		18

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	45·7°	47·9°	50·0°
Highest ,, ,, ,,	49°	51°	52°
Lowest ,, ,, ,,	41°	44°	47°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 91 per cent.

Rain fell on 13 days, to the total depth of 5·03 in. (equivalent to about 23½ gallons of water to the square yard). Heaviest fall on any day 0·77 in., on the 5th.

The prevailing winds were south-westerly.

The average velocity of the wind was 7 miles an hour.

There were 61 hours of bright sunshine, equal to 23 per cent. of the greatest possible amount.

There were 9 days on which no sunshine was recorded.

December.—At Wisley, and over the whole of the south-eastern portion of England, the weather of this month was in one respect very exceptional, inasmuch as there was an entire absence of rough weather, although December is as a rule the stormiest month of the year. In

other respects, however, its weather was typical—it was very cold, and there were several sharp frosts; there was the normal amount of rain, and with it a good deal of snow; there was also very little bright sunshine, but a good deal of dull, overcast weather, and in some districts much mist and fog; some of the densest fogs were very

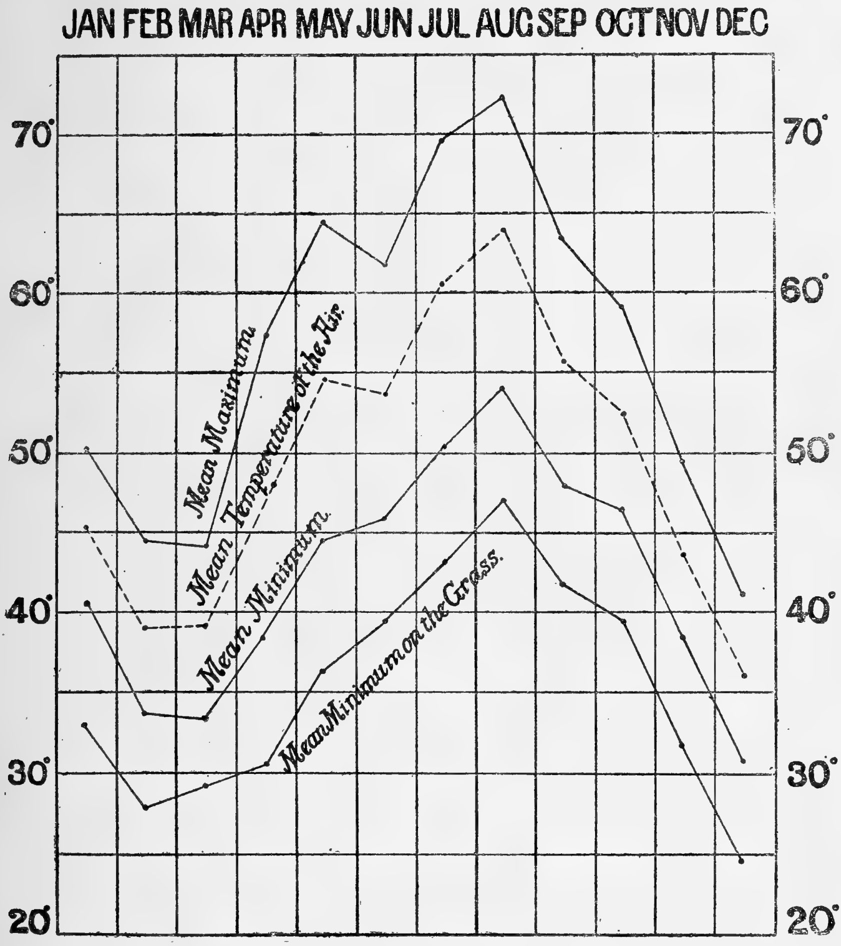

Fig. 33.—Mean Temperature of the Air; Mean Maximum and Mean Minimum Temperature of the Air; Mean Minimum Temperature on the Grass, for each Month.

widespread and caused great interruption to traffic, and in the case of one, which occurred just after Christmas, there were many deplorable accidents in London and its suburbs. The month was in short quiet, fairly dry but abnormally dull, and very cold. The effect of this, following upon a succession of cool months, was to cause a general retardation of vegetation, and at Wisley many things in the Garden were practically a month later in development than usual—autumn-sown peas were nearly a month later germinating than in 1915, and

Hellebores, Hamamelis, and *Berberis Bealei* were a month or even more later than is usual in flowering.

The results from the observations made in the Garden are as follows:

Mean temperature of the air in shade	36·1°		
Highest " " "	51°	on the 29th	
Lowest " " "	24°	" 27th	
" " on the grass	14°	" 16th	
Number of nights of ground frost			25

	At depth of		
	1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	39·2°	41·6°	44·5°
Highest " " "	42°	44°	47°
Lowest " " "	36°	40°	43°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 97 per cent.

Rain fell on 16 days, to the total depth of 2·42 in. (equivalent to about 11¼ gallons of water to the square yard). Heaviest fall on any day 0·49 in., on the 20th.

The prevailing winds were south-westerly.

The average velocity of the wind was 4 miles an hour.

There were 22 hours of bright sunshine, equal to 9 per cent. of the greatest possible amount.

There were 18 days on which no sunshine was recorded.

CELERIAC AT WISLEY, 1916.

SIXTEEN stocks of Celeriac were received for trial in 1916. The seed was sown in pots on March 20 and raised under glass, pricked out into boxes on April 11, and planted in the open ground in shallow trenches on June 8. The plants were 2 feet apart, in rows 2 feet apart. The ground was occupied by the cabbage trial of 1915, and when the cabbages were removed it was deeply dug, but no manure was added.

All plants in the trial remained free from the leaf-spot which affected the Celery (see Celery Trial), although some stocks of seed showed infection. All the seed was steeped in hydrogen peroxide, as is there described, before sowing (p. 109).

The Fruit and Vegetable Committee inspected the plants, which had made excellent growth, on December 14, and selected the following as the best in the trial:

No. 1. Celeriac from Messrs. Sutton.
3. Celeriac from Messrs. Sydenham.
12. Delicatesse from Messrs. Barr.
15. Late Summer from Messrs. Barr.

These were all highly commended (**XXX**).

All the varieties withstood without damage and unprotected the severe frosts of February 1917.

1*. Sutton's Strain (Sutton), **XXX** December 14, 1916.—Bulbs large, smooth, solid; plants dwarf, with little foliage.

2. Common (Barr).—Bulbs of medium size, rather warty, solid; plant tall, with much foliage.

3. Ordinary (Sydenham), **XXX** December 14, 1916.—Bulbs large, fairly smooth, solid; plants of medium height, with moderate foliage.

4. Early Large-rooted (Barr).—Bulbs of medium size, fairly smooth and solid; plant of medium height, with moderate foliage. Not quite true to name.

5. Large-rooted (Carter).—Bulbs large, fairly smooth, rather hollow; plants of medium height, with moderate foliage.

6. Giant Prague (Hurst).—Bulb large, fairly smooth, solid; plant tall, with much foliage. Very like 16, but more solid.

7. Short-leaved (Barr).—Bulb large, rather rough; plants mixed, of tall and medium height, with moderate foliage.

8. Giant Short-leaved (Barr).—Bulb large, fairly smooth, slightly hollow; plants mixed, of tall and medium height, with moderate foliage.

* All plants grown in the Trials are known by a number only until the trial is finished and judgment completed.

9. Paris Market (Barr).—Bulbs large, rough, with many rootlets, slightly hollow; plants of dwarf to medium height, with moderate foliage.

10. Improved Paris (Cooper-Taber).—Bulbs large, rough, with many rootlets, slightly hollow; plants of medium height (some dwarf), with moderate foliage.

11. Non Plus Ultra (Barr).—Bulbs large, rough, with many rootlets, hollow; plants of medium height, with moderate foliage.

12. Delicatesse (Barr), **XXX** December 14, 1916.—Bulbs of medium size, smooth; flesh white, slightly hollow; plant of dwarf to medium height, with little foliage.

13. Apple-shaped (Barr).—Bulbs of medium size, smooth, slightly hollow; plants of dwarf to medium size, with little foliage.

14. Large Erfurt (Hurst).—Bulbs of medium size, rough, hollow, pithy; plants tall, with much foliage of more erect habit than other varieties.

15. Late Summer (Barr), **XXX** December 14, 1916.—Bulbs of small to medium size, smooth, solid; plants very dwarf, with little foliage, which is variegated. This variety matures early.

16. Smooth Prague (Dawkins).—Bulbs of large size, fairly smooth, slightly hollow; plants tall, with much foliage. (See No. 6, which is more solid.)

CELERY AT WISLEY, 1916.

Fifty stocks of Celery were included in the trial of Celery in 1916. The seed was all sown on March 20 in pots under glass; the seedlings were pricked out into boxes on April 11, and transplanted into the trenches on June 6. The ground had been occupied partly by early-flowering chrysanthemums, partly by winter greens in 1915; it was not dug, but trenches about 12 inches wide and 6 feet apart were taken out; into each trench (36 feet in length) two wheelbarrow loads of manure were worked. The plants were set out in a single row 9 inches from plant to plant, and made very good progress until the last week in August, when the Celery leaf-spot disease (due to the fungus *Septoria Petroselini* var. *Apii*, see Journal R.H.S., vol. xxxvii. p. 115, and xl. p. 476) made its appearance in three varieties and quickly spread to others. The three varieties, which were very badly attacked, viz. Nos. 21, 22, and 33, were dug up and burned, and are not described below. Curiously enough, they were all varieties which had received awards in previous trials, seed of which had been purchased for comparison with newer varieties.

The seed sent in was examined when received, and as it was found in several cases to be infected with the fungus above referred to, it was treated by steeping for two hours in a solution of hydrogen peroxide (20 vols.); some of the Celeriac seed also was found to be infected, and this too was steeped. The seed was subsequently dried before sowing, and in no case was the germination adversely affected. Unfortunately, at the time of the treatment, hydrogen peroxide was difficult to get and probably some used was less good than the rest, which may account for the outbreak in the three varieties mentioned. There is no doubt that the handling in removing side shoots preparatory to earthing up and the like assisted in the spread of the fungus, which imposed a serious check upon the plants. Its progress was stopped by spraying on four occasions with Burgundy mixture, different strengths as follows being used on different dates:

Sept. 1.—Copper sulphate, 1¼ lb.; washing-soda, 1½ lb.; soap-powder, 25 oz.; water, 50 gallons.
" 7.—Copper sulphate, 1½ lb.; washing-soda, 1¾ lb.; soap-powder, 25 oz.; water, 50 gallons.
" 14.—Copper sulphate, 1¾ lb.; washing-soda, 2 lb.; soap-powder, 25 oz.; water, 50 gallons.
" 30.—Copper sulphate, 2 lb.; washing-soda, 2¼ lb.; soap-powder, 25 oz.; water, 50 gallons.

Owing to the check imposed by the disease and the heavy rainfall in October earthing up was much delayed. It was commenced in the first week in October, a second earthing was given in the last week of that month, and a final one in the third week in November.

The Celery fly did little damage, for although it made its appearance about the middle of October its progress was stopped by frost.

The Fruit and Vegetable Committee inspected the Trial at intervals during growth, and made their final examination on December 14, when they selected the following stocks as the best in the Trial:

Award of Merit (**A.M.**).

No. 11, 'Invincible White' from Messrs. Dobbie; 30, 31, 'Claygate Prize Pink' from Messrs. Sydenham and Hurst.

Highly Commended (**XXX**).

No. 6, 'Early Rose' from Messrs. Hurst; 26, 'Matchless Pink' from Messrs. Alex. Dickson; 49, 'Incomparable Crimson' from Messrs. Carter.

The severe frosts of February tried the plants very much, but protection afforded by placing dry bracken in the spaces between the ridges proved very effective.

Varieties.*

1. Soup Celery.
2. New White.
3. Borough Market Champion White.
4. Incomparable White.
5. White Gem.
6. Early Rose.
7. A 1.
8. Covent Garden Tall White.
9. Giant White.
10. Sandringham Dwarf White.
11. Invincible White.
12. Matchless White.
13. Incomparable White.
14. Solid Ivory.

15., 16. Solid White.

17. Champion White.
18. Champion Solid White.

19., 20. White Perfection.

21. Aldenham White.
22. Defiance White.
23. Prize White.
24. Superb Pink.
25. New Solid Pink.
26. Matchless Pink.
27. Favourite Pink.

28., 29., 30., 31. Clayworth Prize Pink.

32. Prize Pink.
33. Grove Pink.

34., 35., 36. Aldenham Pink.

37. Aldenham Prize Pink.
38. Pink Beauty.
39. Pink Perfection.
40. Giant Pink.
41. Covent Garden Tall Red.
42. Solid Red.
43. Mammoth Red.

44., 45. Standard Bearer.

46. Matchless Red.
47. Selected Red.
48. Prize Red.
49. Incomparable Crimson.
50. Sulham Prize.

White Varieties.

Both inner and outer leaf-stalks white.

Early.

3. Borough Market Champion White (Cooper-Taber).—Tall; of medium thickness; heart rather loose; flesh soft, pithy; flavour full.

4. Turner's Incomparable White (Nutting), **A.M.** December 18,

* See p. 107.

1907.—Of medium height and thickness; heart solid; flesh crisp; flavour fair.

5. White Gem (Sutton).—Of medium height and thickness; heart solid; flesh crisp; flavour full.

Later.

17. Champion White (Veitch).—Tall; thick; heart solid; flesh pithy; flavour fair.

18. Champion Solid White (Barr), **A.M.** December 18, 1900.—Of medium height; thick; heart rather loose; flesh crisp; flavour fair.

8. Covent Garden Tall White (Barr).—Tall; of medium thickness; heart solid; flesh crisp; flavour fair.

9. Giant White (Hurst).—Tall and rather thin; heart rather loose; flesh crisp; flavour fair.

13. Incomparable White (Sutton).—Tall; thick; heart solid; flesh rather pithy; flavour fair.

11. Invincible White (Dobbie), **A.M.** December 14, 1916.—Tall; fairly thick; heart solid; flesh crisp; flavour good.

12. Matchless White (Dickson).—Tall; thick; heart solid; flesh rather pithy; flavour full.

2. New White (Dobbie).—Of medium height; rather thin; heart fairly solid; flesh rather pithy; flavour good.

23. Prize White (Nutting).—Of medium height; thick; heart fairly solid; flesh crisp; flavour fair.

10. Sandringham Dwarf White (Hurst).—Tall; thick; heart solid; flesh rather pithy; flavour fair.

14. Solid Ivory (Carter).—Of medium height and thickness; heart fairly solid; flesh crisp; flavour fair.

15. Solid White (Sutton), **A.M.** November 23, 1897.—Of medium height; thick; heart solid; flesh crisp; flavour good.

16. Solid White (Simpson).—Of medium height; thick; heart rather loose; flesh crisp; flavour fair.

19. White Perfection (Veitch).—Tall; of medium thickness; heart fairly solid; flesh rather pithy; flavour fair.

20. White Perfection (Watkins & Simpson).—Of medium height and thickness; heart rather loose; flesh crisp; flavour fair.

Pink Varieties.

Both inner and outer leaf-stalks pink.

Early.

7. A 1 (Sutton).—Of medium height; thick; heart solid; flesh crisp; flavour good.

6. Early Rose (Hurst), **A.M.** December 18, 1900; **XXX** December 14, 1916.—Of medium height; thick; heart solid; flesh crisp; flavour good.

34, 35, 36, 37. Aldenham Pink (R. Veitch, Dawkins, Barr, Webb).—Tall and of medium thickness; heart solid; flesh crisp; flavour good.

Later.

28, 29, 30, 31. Clayworth Prize Pink (Dawkins, Watkins & Simpson, Sydenham, Hurst), **A.M.** to Nos. 30 and 31, adjudged the best stocks December 14, 1916.—Tall; thick; heart solid; flesh crisp; flavour good.

27. Favourite Pink (Dobbie).—Tall; thick; heart fairly solid; flesh pithy; flavour fair.

40. Giant Pink (Carter).—Tall; thick; heart fairly solid; flesh pithy; flavour strong.

26. Matchless Pink (A. Dickson), **XXX** December 14, 1916.—Tall; thick; heart solid; flesh crisp; flavour good.

25. New Solid Pink (Barr).—**A.M.** December 18, 1907.—Tall; thick; heart fairly solid; flesh crisp; flavour fair.

38. Pink Beauty (Barr), **A.M.** December 18, 1907.—Tall; thick; heart solid; flesh crisp; flavour strong.

39. Pink Perfection (Webb).—Tall; thick; heart solid; flesh crisp; flavour strong.

32. Prize Pink (Dickson & Robinson).—Of medium height; thick; heart solid; flesh crisp; flavour fair.

24. Superb Pink (Sutton).—Tall; thick; heart fairly solid; flesh crisp; flavour good.

Red Varieties.

Both inner and outer leaf-stalks red.

Later.

41. Covent Garden Tall Red (Barr).—Tall and of medium thickness; heart fairly solid; flesh crisp; flavour fair.

49. Incomparable Crimson (Carter), **XXX** December 14, 1916.—tall; thick; heart solid; flesh crisp; flavour good.

43. Mammoth Red (Webb).—Tall; thick; heart solid; flesh crisp; flavour fair.

46. Matchless Red (A. Dickson).—Tall; thick; heart solid; flesh crisp; flavour fair.

48. Prize Red (Nutting).—Tall and fairly thick; heart solid; flesh crisp; flavour good.

47. Selected Red (Dobbie).—Tall and fairly thick; heart solid; flesh crisp; flavour good.

42. Solid Red (Simpson).—Tall and thick; heart solid; flesh crisp; flavour good.

44, 45. Standard Bearer (Carter, Sydenham).—Tall and thick; heart solid; flesh crisp; flavour good.

50. Sulham Prize (Sutton).—Tall and thick; heart solid; flesh crisp; flavour good.

Green Variety.

1. Soup Celery (Barr).—Tall and thin; no heart; flesh soft. Grown without earthing up, and not blanched. Intended for flavouring, but not considered by the Committee worth growing in the face of better varieties. The plants may, however, be grown as biennials for the ripe seed which is useful for flavouring soups.

POTATOS: EXPERIMENTS IN CULTIVATION, ETC.

NOTE.—The experiments, the results of which are given below, were planned by the Wisley Staff in consultation with the Wisley Development Committee and were carried out by Messrs. CHITTENDEN, WRIGHT, and WILSON, with the assistance of Mr. W. ROGERS in weighing the crops. The labour involved in conducting and recording such experiments is great, and the Council feels that the special thanks of the Society are due to these members of the Wisley Staff for undertaking and carrying them to a successful conclusion, in spite of depleted staff and much additional heavy work.

Those conversant with the way in which wart disease is spreading will recognize the importance of tests in respect to the relative cropping and cooking qualities of wart-resisting varieties (see below).

Next in general interest to the trial of wart-resisting varieties is the spacing experiment (see p. 127). Needless to say, such experiments must be repeated in different soils and with different varieties before the results can be expected to influence general practice; the results obtained this year at Wisley point so uniformly to the conclusion that the closer planting gives the larger yield, that it may fairly be concluded that on such good potato soils as that at Wisley the closer planting may with advantage be practised, with the proviso that the closer the planting the greater the need for early and thorough spraying.

FREDERICK KEEBLE,
Director.

WART-RESISTANT POTATOS AT WISLEY, 1917.

The tumour, black scab, or wart disease of potatos, caused by the attack of the fungus *Synchytrium endobioticum* (or *Chrysophlyctis endobiotica*), fully described in the JOURNAL R.H.S. xxxvii., p. 362, has spread so far and so steadily that there seems grave danger that, in spite of all efforts to prevent it, the whole of the country will before long be infected. No soil or tuber treatment has yet been discovered, although much investigation has been carried out, which will control or even lessen the virulence of the disease, and the only means at present known of procuring a healthy crop of potatos when this fungus is present in the soil is to grow one or other of the varieties which the trials carried out by the Board of Agriculture have shown to be immune from attack.

The varieties which the Board has ascertained to be immune were (with two or three exceptions) collected from various sources and grown side by side at Wisley in 1917, in order to compare their

cropping and cooking qualities, and in the hope of encouraging the raising of further immune varieties possessing good qualities for garden cultivation. Such well-known and widely grown varieties as 'Up-to-Date' and all the forms similar to it, 'King Edward VII.,' and 'Arran Chief' fall ready victims to the disease, so that when attempts are made to grow them in soil infected with the fungus the whole crop is often lost. On the other hand, a considerable number have been discovered by trial to resist the attack of the fungus completely. What produces immunity is unknown, but it is apparently due to some constitutional characteristic found in whole families of potatos, such as the 'Abundance' type, seedlings of 'Great Scot,' and the like and probably breeding from these varieties would lead to the production of even higher yielding varieties than at present exist. While many of those grown showed excellent cropping powers, none seems quite equal to the 'Up-to-Date' group in its power of yielding heavy crops. All the varieties mentioned below were grown, as the Table shows, from either Scotch or Irish seed, and the source of error in comparison between yields introduced by the use of English seed in competition with Scotch or Irish does not exist in this trial. It is, however, to be noted that seed from different parts of Scotland seems to vary in its cropping powers.

Forty tubers of each variety were planted in April in well dug, lightly manured soil, in rows 2 feet 6 inches apart and 18 inches apart in the rows. Several varieties had their growth checked about the beginning of August by an attack of Phytophthora, and none proved entirely immune, but none, with the exception of the earliest, showed much disease in the tubers, either at lifting time or subsequently. The varieties with coloured skins to the tubers appeared to be most resistant to the attack of Phytophthora in the foliage.

The importance of the elimination of "rogues" from resistant varieties scarcely needs comment, but is not always easy. Perhaps the greatest difficulty exists in keeping separate the many closely related forms of one type, such as those capable of being grouped round 'Abundance,' and this does not perhaps greatly matter, since all are apparently resistant. 'Great Scot,' however, a resistant variety, is not easily distinguished either in the tuber or in the growing plant from 'Arran Chief,' a variety that succumbs to the disease. There are characters by which those constantly dealing with the plants may be able to distinguish them from one another, but these characters are mainly comparative, and not always distinct. The most reliable seems to be the colour of the young shoot as it first appears, for that of 'Great Scot' is quite without purple tinge, while that of 'Arran Chief' is always purple. This difference is not always apparent in the older stems, for in these in both varieties the skin is often more or less tinged with purple.

The Vegetable Committee examined the Trials on two occasions, and as a result of their recommendations the awards shown in the following Table were made. The cooking qualities of some of the

WART-RESISTANT POTATOS, 1917.

Variety.	Seed from	Yield of 40 plants. Chats.	Ware and Seed.	Award.	Presented by or purchased from
*1. A1 . .	Scotland	5 6	87 4		Messrs. Sutton.
17. Abundance	Scotland	22 10	128 12		
26. Burnhouse Beauty	Scotland	16 0	116 13	XXX†	,, Dobbie.
4. Conquest .	Scotland	6 11	119 2	XXX	,, Sutton.
19. Culdees Castle	Scotland	7 3	107 6		,, Sutton.
45. Dominion .	Scotland	16 6	124 1	XXX	,, Dobbie.
16. Entente Cordiale	Scotland	8 12	153 15		,, Findlay.
3. Edzell Blue	Scotland	10 1	143 3		,, Dobbie.
13. Favourite .	Scotland	16 0	111 7	XXX	,, Dobbie.
14. Favourite .	Scotland	8 7	130 15		,, Sutton.
30. Golden Wonder	Scotland	2 9	142 3	A.M.	,, Dobbie.
31. Golden Wonder	Scotland	3 11	109 0		,, Sutton.
6. Great Scot .	Scotland	8 10	104 4	A.M.	,, Dobbie.
7. Great Scot .	Scotland	6 2	138 14		,, Sutton.
8. Great Scot .	Scotland	9 3	125 6		,, Veitch.
23. Jeanie Deans	Scotland	9 1	105 8		Mr. R. G. Holmes.
20. King Albert	Ireland	5 10	141 12	A.M.	,, Sands.
5. King George	Scotland	7 12	150 5	A.M.	Messrs. Sutton.
38. Kerr's Pink.	Scotland	4 10	137 11		,, Dobbie.
36. Heather Bountiful	Scotland	6 5	74 2		,, Sutton.
39. Irish Queen.	Scotland	2 12	95 6		,, Sutton.
40. Irish Queen.	Ireland	2 6	122 8		Mr. Sands.
27. Langworthy	Scotland	2 15	118 12	A.M.	Messrs. Dobbie.
28. Langworthy	Scotland	2 10	121 6		,, Sutton.
37. Leinster Wonder	Ireland	6 14	110 11		Mr. Sands.
2. Resistant Snowdrop	Scotland	10 3	107 15		Messrs. Dobbie.
32. Rob Roy .	Scotland	6 8	139 3	XXX	Mr. McAlister.
33. Rob Roy .	Scotland	2 15	119 10		Messrs. Veitch.
44. St. Malo Kidney	Scotland	6 14	128 10	XXX	,, Fidler.
41. Shamrock .	Ireland	3 6	122 9		Mr. Sands.
9. Sir Douglas Haig	Ireland	6 12	150 3	*See* Great Scot	,, Sands.
10. Southampton Wonder	Scotland	4 5	136 13		Messrs. Toogood.
25. The Admiral .	Scotland	5 15	75 10	XXX	,, Dobbie.
22. The Crofter	Scotland	8 15	126 13		,, Dobbie.
21. The Provost	Scotland	2 15	89 2		,, Dobbie.
48. The Laird	Scotland	3 12	96 5		Mr. Davie.
12. The Ally .	Scotland	4 7	143 8		Messrs. Dobbie.
11. The Duchess	Scotland	8 7	136 7		,, Dobbie.
34. The Lochar	Scotland	10 5	163 15		,, Dobbie.
35. The Lochar	Scotland	10 8	142 0		,, R. Veitch.
46. Tinwald Perfection	Scotland	4 14	105 10		,, Dobbie.
24. Twentieth Century	Scotland	2 10	126 8	XXX	,, Sutton.
29. What's Wanted	Scotland	2 11	119 9	*See* Langworthy	,, Sutton.
42. White City .	Scotland	1 3	87 15	XXX	,, Dobbie.
43. White City .	Scotland	1 12	93 9		,, Sutton.

* See footnote, p. 107. † **XXX** means "highly commended."

varieties have again to be tested, as it is only after Christmas that some are at their best.

In addition to the varieties mentioned in the Table, two of which the powers of resisting wart disease are at present unknown, and four varieties which are known to be susceptible to the disease, were grown, viz.:—

Wart-resistance not ascertained.

'Keen's Seedling,' an early white kidney variety, sent by Mr. Notcutt. Crop, 85 lb. 8 oz., including 1 lb. 12 oz., chats. Seed grown in Suffolk.

'Western Hero,' an early white variety, sent by Messrs. R. Veitch. Crop, 93 lb. 10 oz., including 3 lb. 8 oz. chats. (Devonshire seed.) Introduced by Messrs. R. Veitch. **XXX** October, 1917.

Non-resistant varieties.

15. 'Midsummer Early,' an early white round variety, introduced and sent by Mr. Findlay. Crop, 129 lb. 6 oz., including chats 9 lb. 2 oz. Seed grown in Scotland.

A. 'Arran Chief,' a late white round variety, sent by Messrs. R. Veitch. Crop, 142 lb. 8 oz., including chats 5 lb. 19 oz. (Scotch seed.) Raised by Mr. D. McKelvie. **A.M.** 1915.

B1. 'Dalhousie,' a late white variety of the 'Up-to-Date' class from Mr. R. G. Holmes. Crop, 59 lb., including chats 1 lb. 15 oz. from 20 tubers. (Scotch seed.) **A.M.** 1905.

B2. 'Up-to-Date,' a late white variety from Mr. R. G. Holmes. Crop, 75 lb. 10 oz., including 1 lb. 8 oz. chats, from 20 tubers. (Scotch seed.)

DESCRIPTIONS.

I.—Early Varieties.

a. Tubers kidney, white.

2. Resistant Snowdrop.—Plant dull yellowish green; haulm 2 ft. 6 in., sub-erect, tinged; foliage medium, smooth; flowers white, many, persistent; tubers medium to large, rather variable in shape, rough, russeted; eyes shallow, eyebrows inconspicuous; flesh nearly white, firm; fairly mealy, white when cooked. Crop, 118 lb. 2 oz.; scabbed.* Lifted Aug. 13. Introduced by Messrs. Dobbie.

b. Tubers round or flat, white.

1. A1.—Plant shining deep green; haulm 18 in. to 24 in., spreading, tinged; leaves of medium size, somewhat wrinkled; flowers white, few, dropping; tubers medium, smooth, yellowish white; eyes of medium size with rather prominent eyebrows; flesh yellow, firm;

* The term "scab" refers to the common, skin-deep scab, not to the wart disease, or black scab.

rather close, yellow when cooked. Crop, 92 lb. 10 oz.; slightly scabbed. Lifted Aug. 7. Introduced by Messrs. Sutton.

16. Entente Cordiale.—Plant greyish green; haulm 18 in. to 21 in., sub-erect, tinged; foliage narrow, pointed; flowers white, many, dropping; tubers flat round, medium to large, rather irregular, smooth or slightly russeted, yellowish white; eyes rather deep, eyebrows prominent; flesh yellowish, firm; fairly mealy, yellow when cooked. Crop, 153 lb. 15 oz. Lifted August 7. Introduced by Mr. Findlay.

c. Tubers round, coloured.

3. Edzell Blue.—Plant grey-green; haulm 3 ft. 6 in., erect, dark; foliage medium to large, smooth; flowers white, many, persistent; tubers medium to large, usually rough, red-purple; eyes deep, large, eyebrows prominent; flesh white, sometimes tinged purple just beneath skin, firm; fairly mealy, white when cooked. Crop, 153 lb. 4 oz.; very little scab. Lifted August 13.

II.—Second Early Varieties.

a. Tubers kidney, white.

5. King George.—Plant dull yellow-green; haulm 2 ft. 6 in., sub-erect, more or less tinged; foliage large, flat, dull; flowers white, many, persistent; tubers flat kidney, medium, rather irregular, brownish yellow, netted; eyes and eyebrows medium; flesh white, firm; fairly mealy, whitish when cooked. Crop, 158 lb. 1 oz.; very little scab. Lifted Aug. 20. Introduced by Mr. Butler.

b. Tubers round, white.

4. Conquest.—Plant dark shining green; haulm 18 in. to 24 in., spreading, tinged; foliage large, flat, glossy; flowers white, many, dropping; tubers mostly round, medium; skin usually rough, yellowish white; eyes deep at apex, eyebrows rather conspicuous; flesh pale yellow, firm; mealy, creamy yellow when cooked. Crop, 125 lb. 13 oz.; scabby. Lifted Aug. 7. Introduced by Mr. Findlay.

6, 7, 8. Great Scot.—Plant dark green; haulm 2 ft. 6 in., erect, tinged; foliage medium, flat, more or less glossy; flowers white, many, dropping; tubers round, medium, regular; skin rough, yellowish white; eyes medium to deep, eyebrows inconspicuous; flesh pale yellow, firm; mealy, creamy yellow when cooked. Stock No. 6 was partly attacked by 'black-leg,' crop 111 lb. 8 oz.; No. 7, 145 lb.; No. 8 (38 plants), 127 lb. 13 oz., somewhat scabby. Lifted Sept. 11. Raised by Mr. A. W. McAlister.

9. Sir Douglas Haig.—Indistinguishable from 'Great Scot.' Crop, 156 lb. 15 oz. Lifted Sept. 11. Introduced by Mr. Sands.

10. Southampton Wonder.—Indistinguishable from 'Great Scot.' Crop, 141 lb. 2 oz. Lifted Sept. 11. Introduced by Messrs. Toogood.

11. The Duchess.—Plant yellowish green; haulm 2 ft., rather spreading, tinged; foliage large, flat; flowers white, many, dropping; tubers mostly flat round, medium; skin rough, yellowish white, sometimes tinged pink; eyes medium, eyebrows prominent; flesh pale yellow, firm; mealy, creamy yellow when cooked. Crop, 144 lb. 14 oz.; scabby. Lifted August 20. Introduced by Messrs. Dobbie.

12. The Ally.—Plant dull green; haulm 21 in. to 24 in., erect, green; foliage medium, flat; flowers white, few, dropping; tubers mostly flat round, large to very large, irregular; skin rough, yellowish white; eyes mostly superficial, eyebrows rather prominent; flesh pale yellow, firm; fairly mealy, creamy white when cooked. Crop, 147 lb. 15 oz.; scabby. Several plants attacked by black-leg. Lifted August 31.

III.—Maincrop or Late Varieties.

a. Tubers kidney, white.

27, 28. Langworthy.—Plant dark green; haulm 4 ft., erect, green; foliage large, flat, glossy; flowers mauve, many, dropping; tubers medium to large, fairly regular, smooth, yellowish white (sometimes slightly tinged pink); eyes superficial, eyebrows fairly conspicuous; flesh yellowish, firm; mealy, creamy yellow to white when cooked. Crop, Stock No. 27, 121 lb. 11 oz.; No. 28, 124 lb. Slightly scabby. Lifted Sept. 17. Raised by Mr. Niven.

29. What's Wanted.—Indistinguishable from 'Langworthy.' Crop (39 plants), 116 lb. 2 oz. Lifted Sept. 20.

42, 43. White City.—Plant dark green, haulm 2 ft. 6 in. to 3 ft., erect, tinged; foliage large, wrinkled, slightly glossy; flowers mauve, many, dropping; tubers flat kidney, large, rather irregular; skin mostly smooth, yellowish white (sometimes tinged pink); eyes superficial, eyebrows rather prominent; flesh pale yellow, firm; mealy, creamy white when cooked. Crop, No. 42, 99 lb. 2 oz.; No. 43, 95 lb. 5 oz.; scabby, chats very few. Lifted Sept. 17. Raised by Mr. J. Stevenson. Introduced by Messrs. Sutton.

44. St. Malo Kidney.—Plant yellowish green; haulm 2 ft. 6 in., spreading, green; foliage large, wrinkled; flowers mauve, many, dropping; tubers mostly kidney, large; skin rough, yellowish white; eyes superficial, eyebrows inconspicuous; flesh pale yellow, firm; mealy, white when cooked. Crop, 135 lb. 8 oz. Lifted Sept. 11.

23. Jeanie Deans.—Plant dull green; haulm 2 ft. 6 in. to 3 ft., spreading, tinged; foliage large, flat; flowers white, many, dropping; tubers mostly kidney, medium; skin smooth, yellowish white; eyes rather deep, and eyebrows rather prominent; flesh pale yellow, firm; close, and dirty white when cooked. Crop (18 plants), 51 lb. 5 oz. Lifted Sept. 11.

b. Tubers kidney, yellow-brown.

30, 31. Golden Wonder.—Plant dark green; haulm 4 ft., erect, very slightly tinged; foliage large, fairly smooth, glossy; flowers

mauve, many, dropping; tubers medium; skin rough, netted, buff-brown with yellow patches; eyes mostly superficial; skin sometimes very slightly tinged near eye; eyebrows prominent; flesh pale lemon, firm; mealy, yellow when cooked. Crop, Stock No. 30, 144 lb. 12 oz.; No. 31, 112 lb. 11 oz. (The latter contained some yellowish-skinned tubers, the flesh of which was white when cooked.) Lifted Sept. 26. Raised by Mr. Brown.

c. Tubers round or flat round, white or yellowish white.

13, 14. Favourite.—Plant green; haulm 3 ft., erect, tinged; foliage large, flattish; flowers white, many, dropping; tubers flat round, medium; skin smooth, yellowish white; eyes superficial, eyebrows prominent; flesh pale yellow, firm; fairly mealy, creamy white when cooked. Crop, Stock No. 13 (39 plants), 124 lb.; No. 14 (39 plants), 135 lb. 4 oz. (one rogue in each); very scabby. Lifted Sept. 10. Introduced by Messrs. Dobbie.

17. Abundance.—Plant dull green; haulm 4 ft. to 4 ft. 6 in. more or less spreading, stems many, tinged; foliage large, flattish; flowers white, many, dropping; tubers round or flat round, medium to small, irregular, almost smooth, or slightly rough, yellow-white; eyes superficial, eyebrows inconspicuous; flesh yellowish, firm; mealy, creamy white when cooked. Crop (39 plants), 146 lb. 14 oz., including 22 lb. chats. Lifted Sept. 10. Introduced by Messrs. Sutton.

19. Culdees Castle.—Very similar to 'Abundance,' but crop 114 lb. 9 oz. Lifted Sept. 17.

20. King Albert.—Haulm 3 ft. 6 in.; tubers flat round, skin of tuber slightly roughened or netted; otherwise like 'Abundance.' Crop, 147 lb. 6 oz., chats few. Lifted Sept. 17. Introduced by Mr. W. E. Sands.

21. The Provost.—Very similar to 'Abundance,' but crop 92 lb. 1 oz., rather irregular. Lifted Sept. 17.

22. The Crofter.—Haulm 3 ft., slightly tinged; otherwise similar to 'Abundance.' Crop, 135 lb. 12 oz., chats 9 lb. Lifted Sept. 10.

24. Twentieth Century.—Plant rather dark green; otherwise similar to 'Abundance.' Crop, 129 lb. 2 oz., chats few. Lifted Sept. 20.

25. The Admiral.—Haulm 4 ft., erect; flesh rather close when cooked; otherwise very similar to 'Abundance.' Crop, 81 lb. 9 oz. Lifted Sept. 10. Raised by Mr. T. Chapman. Introduced by Messrs. Dobbie.

[The foregoing Nos. 17, 19, 20, 21, 22, 24, 25, are difficult to distinguish from one another. All, after being stored a few weeks, showed traces of pink in the skin or just beneath it, not noticeable at lifting time, and all contained some smooth and some rather netted tubers, the flesh of the former being rather whiter than that of the latter,

Nos. 17, 19, 20, 21, 22, 24, developed hollows in the middle of some of the tubers, and stains in the flesh. Similar hollows and stains were present in Nos. 13 and 14. The foliage of all was attacked by Phytophthora, and some disease was present in the tubers.]

26. Burnhouse Beauty.—Plant green; haulm 4 ft., more or less spreading, stems many, green; foliage large, flat, glossy; flowers mauve, many, dropping; tubers round or flat round, small to medium; skin yellowish white (becoming tinged in store); eyes and eyebrows medium; flesh yellowish, firm; fairly mealy, white when cooked. Crop, 132 lb. 13 oz. Lifted Sept. 11. Some scab. Introduced by Messrs. Dobbie.

32, 33. Rob Roy.—Plant green; haulm 2 ft. to 2 ft. 6 in., spreading, green; foliage medium flat; flowers mauve, few, dropping; tubers mostly flat round, medium to large; skin slightly rough, yellowish white; eyes variable, eyebrows inconspicuous; flesh yellow, firm; close and creamy yellow when cooked. Crop, No. 32, 139 lb. 3 oz.; No. 33, 122 lb. 9 oz., chats few. Lifted Sept. 20. Raised by Mr. McAlister.

48. The Laird.—Plant green; haulm 3 ft., erect, very slightly tinged; foliage large, flat; flowers mauve, many, dropping; tubers flat round, medium; skin somewhat rough, yellowish white; eyes and eyebrows variable; flesh nearly white, firm; close, creamy white when cooked. Crop (39 plants), 97 lb. 11 oz. Lifted Sept. 20. Introduced by Mr. Davie.

46. Tinwald Perfection.—Plant yellowish green; haulm 21 in. to 24 in., spreading, slightly tinged; foliage medium, flat; flowers mauve, many, dropping; tubers flat round, medium to large, russeted, yellowish white; eyes superficial to medium, eyebrows more or less conspicuous; flesh light yellow, firm; close and yellow when cooked. Crop, 110 lb. 8 oz., chats few. Lifted Sept. 17. Raised by Mr. Farish.

45. Dominion.—Plant yellowish green; haulm 3 ft., erect, dark; foliage large, flat; flowers white, many, dropping; tubers flat round, medium, roughish, yellow-white (but becoming much tinged red in store); eyes superficial to medium, eyebrows fairly conspicuous; flesh yellowish, firm; fairly mealy and white when cooked. Crop, 140 lb. 7 oz., including chats 16 lb. 6 oz. Lifted Sept. 11. Introduced by Messrs. Poad.

d. Tubers round, brownish yellow.

37. Leinster Wonder.—Plant dull dark green; haulm 3 ft., erect, slightly tinged; foliage rather small, somewhat wrinkled; flowers white with orange anthers, many, persistent; tubers round, medium; skin rough, netted, sometimes pink tinged; eyes rather deep, eyebrows somewhat prominent; flesh nearly white, firm; mealy and creamy white when cooked. Crop (37 plants), 109 lb. 2 oz. Lifted Sept. 26. Introduced by Mr. W. E. Sands.

e. Tubers round or flat round, coloured.

34, 35. The Lochar.—Plant dull green; haulm 3 ft. 3 in., erect, green; foliage large, flat; flowers white, many, dropping; tubers flat round or round, of rather squarish build, small to medium, rather irregular; skin smooth, with pinkish flush and pink lenticels; eyes rather deep, eyebrows variable; flesh very pale yellow, firm; close and white when cooked. Crop, No. 34, 174 lb. 4 oz. (chats 10 lb.), lifted Sept. 17; No. 35, 152 lb. 8 oz. (chats 10 lb.), lifted Sept. 21. This was the heaviest cropper in the trial, the greater proportion of the tubers being on the small side. Raised by Mr. Farish.

36. Heather Bountiful.—A less vigorous stock, sometimes tinged in haulm, but otherwise like 'The Lochar.' Crop (39 plants), 78 lb. 10 oz. Lifted Sept. 20.

38. Kerr's Pink.—Plant grey-green; haulm 3 ft. 3 in., erect, tinged; foliage medium, somewhat wrinkled; flowers white, many, dropping; tubers flat round or round, large; skin, more or less smooth, more or less pink, especially at rose end and round eyes; eyes deep, eyebrows variable; flesh yellowish, firm; mealy, creamy white when cooked. Crop, 142 lb. 5 oz. Lifted Sept. 26.

39, 40. Irish Queen.—Plant dull green; haulm 3 ft. 3 in. to 3 ft. 6 in., erect or somewhat spreading, slightly tinged; foliage large, flat; flowers mauve, few, dropping; tubers round, medium; skin fairly smooth, pink; eyes fairly deep, eyebrows prominent; flesh nearly white, firm; close and creamy white when cooked. Crop, No. 39, 98 lb. 2 oz.; No. 40 (39 plants), 121 lb. 9 oz., scabby. Lifted Sept. 17. Introduced by Mr. W. E. Sands.

41. Shamrock.—Plant dull dark green; haulm 3 ft., erect, green; foliage rather small, wrinkled; flowers white with orange anthers, many, persistent; tubers round, large; skin more or less rough, netted, red; eyes deep, eyebrows not very prominent; flesh pale yellowish, pink just within skin, firm; white and close when cooked. Crop (39 plants), 122 lb. 14 oz. Lifted Sept. 26. Introduced by Mr. W. E. Sands.

EXPERIMENTS IN CULTIVATION OF POTATOS.

In addition to numerous variety trials of Potatos at Wisley during 1917, several series of experiments designed to ascertain the effects upon the yield of different methods of treating seed tubers were carried out.

These experiments dealt with:

I. The cutting of seed tubers (see below).
II. The effect of various dressings on the cut surface of these tubers (p. 125).
III. Greened and not-greened seed tubers with different numbers of sprouts *v.* tubers taken straight from the clamp (p. 125).
IV. Planting tubers of different sizes (p. 126).
V. The effect of planting at different distances apart (p. 127).
VI. The effect of date of planting (p. 128).

In every case precautions were taken to obviate as far as possible errors due to differences in soil. This was usually done by repeating the treatment on two or three plots. Care was also taken that every group of plants had similar exposure to that with which it was to be compared, and in other ways to make the comparison between the plots as fair as it could possibly be.

The results are set out below:

I. The Effect of Cutting Seed Tubers.

The variety used in this experiment was 'Factor.' The seed was grown at Wisley (third year) and was planted in mid-April, the rows being 27 in. apart, and the plants 18 in. apart in the rows. The plants were arranged in blocks of four rows of five plants, four blocks running across one of the garden plots. Twenty plants were grown under each treatment. The different treatments and the yields are shown in the table (p. 124).

Taking the first eight groups first, it is evident that cutting the tubers tends to reduce the total crop, for No. 1 gave a greater yield than any of the others, while No. 2, where only the extreme heel end of the tuber was sliced away, was slightly less. [There is a prevalent idea that unless the seed tuber "decays" the resulting crop is sure to be small, and this is generally true, but the cutting away of the basal part of the seed tuber is often stated to be an aid to the requisite "decay." Such cutting, however, has no influence in rendering the contents of the seed tuber available for the sprouts. In this series

of experiments the tubers all decayed normally whether cut or not, but in another planting, of 'Midlothian Early,' where the crop was very poor, none of the tubers decayed whether cut or not.]

It is clear also that the "rose end," where the greater number of eyes and usually the best developed eyes are situated, tends to give a higher yield than does the "heel end," *i.e.*, the end of the tuber bearing the tag which attached it to the old plant. This point is confirmed by comparing Nos. 9 and 10 with Nos. 11 and 12, where the same tendency is apparent. The "rose end" seems, too, to possess some advantage over the half tuber cut lengthwise, *i.e.* where "rose end" and "heel end" are both represented, for the yield of No. 7 is higher than either No. 5 or No. 6. The lower yield of Nos. 5 and 6 may be due to the increased amount of unprotected surface exposed, for the size of the surface exposed seems to have had some effect upon the yield when a long time elapsed between cutting and planting. The tubers cut lengthwise in January gave a smaller yield than those cut in the same way immediately before planting; the difference was much less when the tubers were cut crosswise and similarly treated; and merely cutting away the extreme heel end reduced the yield but little. In this series liming the cut surface, whether the cut was made at planting time or in January, seems to have reduced the yield to some extent, unless the failure of two sets in the unlimed January cut series (No. 5) is to be attributed to the cutting.

Nos. 9 to 12 were larger tubers than those used in groups Nos. 7 and 8, and gave larger yields under similar treatment. This result should be compared with those in Series IV.

	Sets.				No. of plants surviving.	Yield.			
	Size.	Cut.	Time of Cutting.	Limed or not.		Ware.	Chats.	Total.	Average.
						lb. oz.	lb. oz.	lb. oz.	lb. oz.
1	Seed	Not cut	—	—	20	50 10	2 6	53 0	2 10½
2	,,	Sliced at bottom	Planting time	Not	20	49 4	1 10	50 14	2 8¾
3	,,	Lengthwise	,,	,,	20	48 6	1 5	49 11	2 7½
4	,,	,,	,,	Limed	20	45 4	11	45 15	2 4¾
5	,,	,,	January	Not	18	34 4	1 0	35 4	2 0
6	,,	,,	,,	Limed	20	34 6	12	35 2	1 12
7	,,	Rose end	,,	,,	20	44 2	1 11	45 13	2 4¾
8	,,	Heel end	,,	,,	20	37 15	14	38 13	1 15
9	Ware	Rose end	Planting time	,,	20	49 5	1 11	51 0	2 9
10	,,	,,	January	,,	20	49 6	1 2	50 8	2 8½
11	,,	Heel end	Planting time	,,	20	42 9	1 6	43 15	2 3
12	,,	,,	January	,,	20	41 10	1 0	42 10	2 2

It may be pointed out that, where seed is scarce or expensive, cutting the sets, in spite of the reduction in yield from each plant, gives a much greater return from a given weight of seed. Thus the twenty uncut tubers gave a crop of 53 lb.; but twenty seed tubers of the same

size cut in half lengthwise at planting time to make forty plants gave 95 lb. 10 oz.; twenty of the same size cut in half lengthwise in January, of which thirty-eight halves survived, gave 71 lb.; twenty of the same size cut in half transversely to make forty plants gave 84 lb. 10 oz.

II. The Effect of Various Coverings on Cut Surfaces of Potato Tubers.

In order to test the effect of various substances which might be used for covering the surface of tubers cut for propagation purposes in order to prevent loss of moisture, &c., a number of tubers of seed size (var. 'Factor') were cut lengthwise in January and dusted with the substances mentioned in the following table. The cut tubers were planted in mid-April after sprouting, in rows 27 inches apart and 18 inches apart in the rows, and the different groups of twenty cut pieces arranged as in Series I.

Covering.	No. of plants surviving out of 20.	Weight of Crop. lb. oz.
1. No covering	20	28 10
2. Keen's Cement . . .	19	33 15
3. Painter's Knotting . . .	16	21 6
4. Size	20	32 13
5. Loam	19	24 11
6. Sand	16	26 8
7. Plaster of Paris . . .	19	38 8
8. Flowers of Sulphur . . .	20	32 4

It seems evident that plaster of Paris is one of the best materials for checking loss of moisture where tubers are cut before planting, while Keen's Cement, Size, and Flowers of Sulphur follow. As might be expected, loam and sand are of little use, but Painter's Knotting, strangely enough, seems actually detrimental, for, while four of the twenty halves died, the surviving sixteen gave a smaller average crop than any of the others.

III. Effect of Greening and Number of Sprouts on Seed Potatos on Yield.

The importance of sprouting potatos before planting them is now almost universally recognized, although there still prevails an erroneous idea that sprouting is necessary only in the case of early varieties. The increase in yield of all varieties through sprouting has been found to average two tons to the acre, and it is therefore manifest that sprouting before planting ought not on any account to be neglected. In this experiment the results of sprouting in full light show only a negligible advantage over those obtained by sprouting in the dark; but it is to be observed that the short, sturdy sprouts formed on tubers

sprouted in the light are less liable to damage during planting than are the more slender, delicate shoots produced when tubers are sprouted in the dark.

At the same time the yield of tubers sprouted in trays, whether in the light or in darkness, is in remarkable contrast with that of tubers of the same stock kept in the clamp and urged to the production of spindly sprouts exhausting the tuber by the conditions there.

Group.	Treatment.	No. of sprouts left when planting.	Yield.		
			Ware and Seed.	Chats.	Total.
			lb. oz.	lb. oz.	lb. oz.
1	Greened and sprouted	1	41 13	0 12	42 9
2	" "	2	49 2	0 14	50 0
3	" "	none	31 6	1 14	33 4
4	" "	all	48 9	1 14	50 7
5	Sprouted in dark	1	44 1	0 11	44 12
6	" "	2	49 4	1 0	50 4
7	" "	none	37 7	1 4	38 11
8	" "	all	41 15	0 11	42 10
9	Exhausted and shrivelled in clamp	1	37 13	1 1	38 14
10	" "	2	41 6	1 0	42 6
11	" "	none	23 3	2 3	25 6
12	" "	all	34 2	2 14	37 0

The variety used was 'Factor,' as in Series I. and II.; the tubers were of seed size; and they were planted as described in the first two series. Twenty plants were grown in each group. The superiority of the seed sprouted in trays over that allowed to sprout and exhaust itself in the clamp is plain from the foregoing table, for the average yield of the tray-sprouted seed was 2 lb. 2½ oz. of useful produce, while that from the clamp-exhausted tubers was only 1 lb. 10 oz., an advantage of over ½ lb. a plant in favour of tray-sprouting.

It is also evident that in all cases it was better to leave one sprout than to rub all off at planting time, and better still to leave two sprouts than one. To leave two sprouts seems also better than to leave all produced; the advantage is shown both in total yield and in the weight of chats produced, for usually more chats were produced where all sprouts were left than where all were removed but one or two.

The reduction in crop where all the sprouts are removed is doubtless due in part to partial exhaustion of food material, and in part to delay in starting growth and the consequent shorter growing period. The latter point is well illustrated in Series VI. of these experiments.

IV. Effect of Size of Seed on Tuber Yield.

Another series of experiments throws some light on the reason of the low yields from exhausted tubers seen in Series III. The small tubers of one ounce gave a markedly smaller yield than those of two

ounces or over. ' Factor ' was used in this series, the seed tubers being taken from the same stock as those used in the first three series of experiments. The distance apart was the same as in the foregoing, and twenty tubers were planted in a row. There were three groups, in one the seed tubers weighed approximately one ounce each, in the second two ounces, and in the third three ounces, and each group was repeated four times, so that eighty seed tubers of each kind were planted. The planting was done in mid-April, and the plants were lifted and weighed on September 3 after they had died down.

Size of Tuber.	Yield.		
	Ware and Seed.	Chats.	Total.
	lb. oz.	lb. oz.	lb. oz.
1. Small, about 1oz. . . .	145 14	5 1	150 15
2. Medium, about 2 oz. . .	175 10	5 0	180 10
3. Larger, about 3 oz. . .	183 8	5 6	188 14

The yield of the medium and larger tubers, of about the size usually regarded as "seed size," was markedly greater than that of the small tubers, and the chats were somewhat less in proportion to the yield. A striking thing, however, which is not brought out in the table, but which is evident on comparison of the weights of the individual plant-yields, is the tendency of the small tubers to produce a great proportion of plants giving only a small yield and a small proportion only giving a larger yield than the average. The contrast in this direction with the yield of those of a larger size is very marked.

V. Effect of Spacing on Yield.

An endeavour was made to ascertain the effect of the amount of space available for the development of the individual plant upon the yield both of the individual and of equal plots of land occupied by the differently spaced plants. The variety ' Arran Chief ' was used in this experiment, the seed having been grown at Wisley in 1916. As usual, the seed was sprouted before planting. The crop was lifted after the plants died down in September 1917. The results are shown in the following table, where each space represents an area of one square rod; the top line in each space shows the distance apart of the rows and the plants in the rows on the plot in inches, and the area occupied by each plant in square feet; the first row of figures shows the yield of ware and seed, the second the weight of chats, and the third the total yield from a plot of one square rod; and the last line shows the average weight of produce from each root. The exposure of all the plants on each plot was the same; failures in the rows have been allowed for in arriving at the totals and averages, and the totals given are averages of duplicate series.

1 24″ × 12″ = 2 sq. ft.	lb.	oz.	2 24″ × 15″ = 2½ sq. ft.	lb.	oz.	3 24″ × 18″ = 3 sq. ft.	lb.	oz.
Ware and seed .	227	12	Ware and seed .	199	1	Ware and seed .	184	8
Chats . .	28	9	Chats . .	22	11	Chats . .	15	11
Total . .	256	5	Total . .	221	12	Total . .	200	3
Average plant .	1	14½	Average plant .	2	1	Average plant .	2	7

4 30″ × 12″ = 2½ sq. ft.	lb.	oz.	5 30″ × 15″ = 3⅛ sq. ft.	lb.	oz.	6 30″ × 18″ = 3¾ sq. ft.	lb.	oz.
Ware and seed .	187	11	Ware and seed .	198	1	Ware and seed .	202	6
Chats . .	23	0	Chats . .	21	13	Chats . .	17	0
Total . .	210	11	Total . .	219	14	Total . .	219	6
Average plant .	2	0	Average plant .	2	9	Average plant .	3	4

7 36″ × 12″ = 3 sq. ft.	lb.	oz.	8 36″ × 15″ = 3¾ sq. ft.	lb.	oz.	9 36″ × 18″ = 4½ sq. ft.	lb.	oz.
Ware and seed .	181	13	Ware and seed .	172	2	Ware and seed .	164	0
Chats . .	20	5	Chats . .	12	3	Chats . .	15	11
Total . .	202	2	Total . .	184	5	Total . .	179	11
Average plant .	2	4	Average plant .	2	10	Average plant .	3	4

It will be seen that, within the limits of spacing used in this series of experiments, two points stand out quite clearly:

1. The greater the space given to the individual plant the greater the yield of that individual is likely to be.
2. The greater the number of plants on a given area the greater the yield from that area will be.

It follows that in order to produce the greatest yield from a given area, planting of potatos must be somewhat close rather than wide (*i.e.* within the limits shown by this experiment); but if it is desired to raise a large quantity from a small number of seed-tubers the tubers must be planted far apart.

VI. Effect of Time of Planting on Yield.

Sprouted seed tubers of approximately equal size of the same stock of the variety 'Windsor Castle,' grown at Wisley in 1916, were planted on five different dates, viz. April 4, April 16, May 1, May 15, June 1 respectively. They were planted in rows 2 feet 6 inches apart and 18 inches apart in the rows, and were grouped in sets of sixty plants, twenty in a row, each group being duplicated, so that

120 tubers were planted on each date. The yields were as follows. The plants were lifted as they died down:—

Planted.	Lifted.	Yield.		
		Ware and Seed.	Chats.	Total.
		lb. oz.	lb. oz.	lb. oz.
1. April 4	August 31	262 12	9 11	272 7
2. ,, 16	,, 31	274 5	9 3	283 8
3. May 1	September 3	274 1	11 15	286 0
4. ,, 15	,, 20	229 5	11 13	241 2
5. June 1	,, 20	172 2	14 0	186 2

There is little difference in the yields of the first three plantings, no doubt because the weather up to the middle of April did not encourage growth, while after that the plants made steady progress without the usual set-backs due to late frosts and the like; but the late plantings, especially the June one, led to serious reductions in the crop, moreover the proportion of chats was markedly greater in both late plantings, but especially in the June-planted set. April seems the best month to plant at Wisley, and though seasons may make some difference, for all but quite early varieties planted in the most favourable positions probably from the middle to the end of the month is best if the seed is previously sprouted.

A STANDARDIZED POTATO TRIAL.

By W. CUTHBERTSON, V.M.H.

IN the autumn of 1916 I decided to carry out in 1917, if possible, a series of Potato Trials in different parts of the country on a better basis than that of any former trials. For a long time I had recognized that the Royal Horticultural Society's and all other Potato Trials had an unsatisfactory basis, in so much that the seed tubers used came from all parts of the country—from Devonshire to Aberdeenshire and from Ireland.

At the Potato Conference at Ormskirk, under the auspices of the Board of Agriculture and the Lancashire Farmers' Association, in October 1916, I explained my scheme, and offered collections to those willing to assist. In the beginning of December I sent the undernoted letter to the following nine gentlemen, without whose help the work could never have been done, and to whom I feel deeply indebted:

Professor Seton, The University, Leeds.
Dr. Keeble, F.R.S., Director, R.H.S., Wisley.
Professor Barker, University of Bristol.
Mr. W. D. Davidson, Dept. of Agriculture for Ireland.
Mr. W. Mauger (Mauger & Son), Guernsey.
Mr. P. C. M. Veitch (Robert Veitch & Son), Exeter.
Mr. E. J. Deal (Johnsons Ltd.), Boston, Lincolnshire.
Mr. Sowman, Lancashire C.C., Hutton.
Mr. G. T. Malthouse, Shropshire C.C., Shrewsbury.

Mr. James Bone (Dobbie & Co.), Edinburgh, had charge of the tenth lot.

POTATO TRIALS.

"DEAR SIR,—With reference to the offer I made at the Ormskirk Conference, I now beg to say that I am in a position to send you twenty varieties of potatos, twenty sets of each, if you think you can find time and facilities to grow them next season. The seed has all been standardized by having all been grown in a market garden near Edinburgh last season. Previous to that, of course, it was all Scotch-grown stuff, but grown in different districts. I suggest that the twenty varieties should be grown in lines 3 feet apart and the sets placed 18 inches apart. This distance you may consider rather wide for early varieties, but it will enable you to better observe the characters of the plants. I would further suggest that the ground should be dug one spit deep now and manured with farmyard manure at the rate of 20 tons per acre. The question of artificial manure I am asking

Professor Seton's opinion regarding. We should all apply the same dressing in the drills when planting in spring.

"Will you kindly let me know if you are prepared to receive the 400 tubers now and box them? If all can do this it would add another point of uniformity to the Trials.

"Yours faithfully,

"W. CUTHBERTSON."

In February I wrote as follows to each:

"*Manuring.*—Professor Seton (with whom I discussed the matter of artificials last week) and I decided that all should have a moderate dressing in the drills at planting time if potash could be got. I have secured some potash (45 per cent.), and I hope to send you later a little bag of manure worked out on the basis of 1 cwt. sulphate of ammonia, 4 cwt. superphosphate (26 per cent.), and 1 cwt. potash per acre. Each trial plot should extend to about 200 square yards. The produce will become the property of the experimenter.

"Should any of the tubers sent you have suffered by the recent frost, please let me know and I will repeat them if possible.

"Yours,

"W. CUTHBERTSON."

On March 19, 1917, I wrote to each:

"DEAR SIR,—I have sent you per passenger train, carriage paid, 35 lb. artificial manure, prepared on the basis of a 6 cwt. dressing per acre (1 cwt. sulphate of ammonia, 1 cwt. sulphate of potash, 4 cwt. 26 per cent. superphosphate). It is hoped all the potatos will be planted between now and Easter, and, as suggested, in lines 3 feet apart and 18 inches between the sets. The precaution of planting one or two rows at each end of the trial plot with a variety which is not in the trial will be evident, and will, no doubt, be done in every case.

"Yours,

"W. CUTHBERTSON."

The tables on pages 132–4 give the returns.

NATURE OF SOILS ETC.

The following particulars furnished by the growers will indicate the nature of the soils on which the potatos were grown. The localities are given in the same order as in the table:

1. Guernsey. The soil is of a very sandy nature and has carried bulbs for many years. It was reclaimed from the sea in 1812, and up to twenty-five years ago produced little. When it came into our possession it was drained and many thousands of loads of sandy road sweepings were added. It lies eight feet above sea-level.

2. Edinburgh. Free loam on market garden land at Joppa, four miles east of Edinburgh.

3. Bristol. Sandy to medium loam with a tendency to stickiness on surface after heavy rain, caking on drying, at Long Ashton, four miles west of Bristol, 160 feet above sea level. Followed nursery apples.

YIELD OF POTATOS IN LB.

—	Guernsey.	Edinburgh.	Bristol.	Leeds.	Wisley.	Boston, Lincs.	Co. Down, Ireland.	Exeter.	Preston.	Salop.	Total.
EARLY VARIETIES.											
Sir J. Llewelyn . .	71	72	88	89	75	76	81	63	65	66	746
*Snowdrop (Resistant)	60	61	64	58	59	75	72	58	53	54	614
Sharpe's Express .	55	63	66	64	58	77	66	48	54	55	606
Witch Hill . .	65	62	56	59	55	75	66	50	53	44	585
Midlothian Early .	64	47	22	49	56	34	46	23	49	38	428
SECOND EARLY VARIETIES.											
British Queen . .	90	87	87	80	87	94	79	78	54	63	799
*Great Scot . .	80	94	93	69	46	42	54	36	44	35	593
*Secundus . .	75	45	92	50	42	59	46	76	29	53	567
*Burnhouse Beauty .	60	60	43	55	56	57	56	48	51	42	528
*Dobbie's Favourite .	73	75	31	65	61	26	53	29	47	19	479
MAIN CROP VARIETIES.											
Dobbie's Prolific .	115	79	65	54	74	66	63	61	53	38	668
*The Provost . .	64	79	90	52	71	70	52	70	48	54	650
The Factor . .	80	77	51	68	79	53	77	56	74	28	643
King Edward . .	48	68	88	71	67	80	61	50	30	38	601
*The Admiral . .	71	48	83	57	50	68	29	79	44	47	576
*Kerr's Pink . .	77	85	50	67	66	52	51	47	43	31	569
Arran Chief . .	45	54	40	59	61	52	55	77	55	34	532
Isis	59	65	55	59	52	55	39	44	47	23	498
*White City . .	36	56	46	58	62	56	44	56	44	30	488
*The Lochar . .	52	60	45	55	41	32	44	46	39	22	436
Total . .	1340	1337	1255	1238	1218	1199	1134	1095	976	814	11,606

* Resistant to wart disease.

4. Leeds. Medium loam soil overlying coal measure sandstone, at Garforth Manor Farm, eight miles east of Leeds.

5. Wisley. Light sandy loam at junction of Bagshot sands and London clay, at R.H.S. Gardens, Wisley, Ripley, Surrey, 120 feet above sea level.

6. Boston, Lincs. Light top soil on heavy bottom.

7. Co. Down. Reclaimed mountain land which had previously grown nothing but bracken. A gravelly loam at Burrenreagh, Castlewellan ; soil as a rule very suitable for potato-growing.

8. Exeter. Dark stiff loam with a clay and gravel subsoil, at Cleve Nursery, Exwick, growing young conifers for past six years.

9. Preston. A hazel loam one year from pasture at Council Farm, Hutton, nr. Preston, 82 feet above sea level.

10. Shropshire. A medium loam containing a fair quantity of flinty stones. Old pasture bastard trenched early in 1917 at Oswestry.

The following table shows the weight of seed of each variety sent to each station :

WEIGHT OF "SETS" SENT TO EACH STATION IN LB.

—	Guernsey.	Edinburgh.	Bristol.	Leeds.	Wisley.	Boston, Lincs.	Co. Down, I.	Exeter.	Preston.	Salop.	**Total.**
					EARLY VARIETIES.						
Sir J. Llewelyn .	2¼	2⅛	2½	2⅛	2⅛	2½	2¼	2½	2¼	2⅝	23⅛
Snowdrop (Resistant)	2⅝	2¼	2½	2½	2¼	2½	2¼	2⅝	2⅜	2½	24⅜
Sharpe's Express .	2⅝	2½	2½	2¾	2½	2½	2¼	2⅝	2⅝	2⅝	25½
Witch Hill . .	2⅝	2¾	2½	2⅞	2⅞	2½	2⅞	2½	2⅞	2⅝	27
Midlothian Early .	2⅝	2¾	2¾	2¾	2⅝	2⅞	2⅝	3	2½	2⅞	27⅜
					SECOND EARLY VARIETIES.						
British Queen .	2⅝	2⅞	2½	2⅞	2⅞	2⅝	2⅞	2½	3	2⅝	27⅜
Great Scot . .	3¾	2¾	3½	2½	2½	3	2¼	3½	2½	3¼	29½
Secundus . .	2⅝	3½	2⅝	3⅜	3⅝	2⅝	3½	2¾	3⅞	2⅝	31⅛
Burnhouse Beauty .	2¾	2⅝	2¾	2⅜	2¾	2¾	2⅝	2¾	2⅜	2¾	26½
Dobbie's Favourite.	2⅞	3	2⅞	2⅝	3⅛	3	2⅞	2⅞	2⅝	2¾	28⅝
					MAIN CROP VARIETIES.						
Dobbie's Prolific .	2¼	3	3¼	2⅞	3⅛	3⅜	2⅞	3	2⅞	3	29⅝
The Provost . .	2⅝	2¼	2¾	2⅝	2½	2¾	2⅝	2⅝	2¼	2¾	25¾
The Factor . .	2⅝	2¾	2⅝	3	2⅞	2⅝	2⅝	2¾	2⅝	2¾	27¼
King Edward. .	2⅞	3	2½	3⅜	3¼	2⅜	3⅜	2¾	3¼	2¼	29
The Admiral . .	2⅞	2⅝	2¾	2⅝	3⅛	2⅞	2⅞	2¾	2⅝	2⅞	28
Kerr's Pink . .	2½	2¾	2¾	2¾	2¼	2⅝	2⅞	2¾	2½	2½	26¼
Arran Chief . .	3¼	2½	2½	2⅞	2¾	2½	2¾	2⅞	2⅞	2½	27⅜
Isis . . .	2⅝	2⅛	2⅝	2½	2¼	2⅝	2½	2⅝	2¾	2½	25⅛
White City . .	3½	3	3⅜	3⅜	3⅛	3¼	3⅛	3⅜	3	3¼	32⅜
The Lochar . .	2½	2½	2½	2⅝	2½	2½	2½	2½	2½	2½	25⅛
											546⅜

I have a lot of detailed information from the different growers, but considerations of space prevent my giving it. The wet August adversely affected the crop of the late varieties, and so did the dry July, while the dryness of July helped the early varieties to finish off well. Mr. Sowman reports that during the growing period the plants were closely inspected. No variations in foliage of each individual variety could be detected to warrant the marking of any as rogues. Disease was more prevalent in the south than in the north. All crops were weighed as lifted. Both Mr. Veitch of Exeter and Professor Barker of Bristol speak of rust attacking 'Midlothian Early' badly. While there was no rust on any of the varieties in the

lot at Edinburgh, it was rather prevalent in the field crops in Mid and East Lothian in 1917. It is most injurious to the crop, and if it occurs badly again will demand investigation. Many of the varieties gave an average of 4 lb. a root, which at 3 feet × 18 inches represents a crop of 18 tons an acre.

Professor Seton, discussing future trials, says: "It becomes a question as to the relative merits of a repetition of the same experiment or a test as you suggest between new varieties and the older varieties that have done best this year." Professor Seton favours a repetition of the 1917 trial because "one season's results are not sufficient to determine which are the best." In these times of labour shortage and so many calls on one's time I feel loth to ask busy men to undertake extra work, but most, I think, will agree that we should do something in 1918.

The following table shows the total crop at each of the stations and the aggregate yield of each of the varieties at the ten stations:

Total crop at the different stations.	Lb.	Varieties arranged in order of aggregate weight at ten stations.	Lb.
Guernsey	1,340	1. British Queen	799
Edinburgh	1,337	2. Sir J. Llewelyn	746
Bristol	1,255	3. Dobbie's Prolific	668
Leeds	1,238	4. The Provost	650
Wisley	1,218	5. The Factor	643
Boston, Lincs.	1,199	6. Snowdrop (Resistant)	614
Co. Down (I.)	1,134	7. Sharpe's Express	606
Exeter	1,095	8. King Edward	601
Preston	976	9. Great Scot	593
Salop	814	10. Witch Hill	585
		11. The Admiral	576
	11,606	12. Kerr's Pink	569
		13. Secundus	567
Total weight of seed planted at the different stations	546⅞	14. Arran Chief	532
		15. Burnhouse Beauty	528
Ratio of increase	21	16. Isis	498
		17. White City	488
		18. Dobbie's Favourite	479
		19. The Lochar	436
		20. Midlothian Early	428
			11,606

MAINCROP AND LATE POTATOS AT WISLEY, 1916.

NINETY-SEVEN stocks of Potatos were grown in the trials of late and maincrop varieties at Wisley 1916, including several varieties that had received Awards in earlier years for comparison with newer ones. Twenty tubers of each were planted on April 25 in rows 3 feet apart and 18 inches apart in the rows in well-dug ground heavily manured for the previous cabbage crop. The sets had been sprouted before planting. Almost all the stocks made good growth, and in many cases excellent yields were obtained. The cultivation was under the charge of the Superintendent, Mr. S. T. Wright, and Mr. J. Wilson.

The soil of the Wisley Garden is well suited to almost all varieties of Potato, the only exceptions being those few varieties which are best suited by a stiff clayey soil. In comparing the yields in the records given below, it must be remembered that the quality of the seed has a great deal to do with the yield, and one of the chief factors governing seed-quality is the place in which the seed is grown. Indeed, the difference in yield between different stocks of the same variety from seed of the same size, treated in all respects in the same way and grown under precisely similar conditions, may be greater than that between a normally poor-yielding variety and a heavy-yielding one. This is well brought out in the present trial by comparing the yields of a variety of which two or more stocks from different districts were included, *e.g.* 'Arran Chief.' Of these there were three English stocks, one from the West of England giving 71 lb., one from Bucks giving 61 lb., and one from another locality giving 48 lb. Three came from Scotland giving 79 lb., 78 lb., and 76 lb. respectively, and one from Ireland giving 76 lb. The same kind of thing is seen by comparing the yields given by the two stocks of the Factor (Nos. 82 and 83) where the seed grown in Bucks gave only 58 lb., while that from Scotland gave 89 lb. The superiority of the Scotch and Irish seed over most English seed is unmistakable, and while there are undoubtedly other factors at work which render the seed better or less good, and while doubtless also some districts of Scotland and Ireland are better for seed-potato growing than others, the fact that the seed used in this trial came from different districts prevents any exact comparison of the power of cropping being made between all the varieties included. The weight of crop given therefore shows only what may reasonably be expected from the varieties when grown from seed produced in the districts from which those grown in this trial came. Scotch-grown varieties may usually be safely compared with Scotch-grown and so on.

The Fruit and Vegetable Committee examined the trial when the

potatos were lifted on September 5, 1916, and made the following recommendations for awards:

Highly Commended (**XXX**).

93. Donside Defiance, sent by Mr. David Cook.
88. King Edward, sent by Messrs. Dobbie.
76. Rob Roy, sent by Messrs. R. Veitch.

Commended (**XX**).

18. Arran Chief, sent by Messrs. Dobbie (**A.M.** 1915; Messrs. R. Veitch).
6. Cropper, sent by Mr. Anketell-Jones.
58. Drumwhindle, sent by Mr. Lewis Gavin.
89. Irish Chieftain, sent by Lissadell.
74. Langworthy, sent by Messrs. Dobbie.
30. Prolific (Dobbie's), sent by Messrs. Dobbie.
42. Superlative, sent by Messrs. Sutton.
10. The Chapman, sent by Messrs. Dobbie.
83. The Factor, sent by Messrs. Dobbie (**F.C.C.** 1905; Messrs. Dobbie).
8. The Provost, sent by Messrs. Dobbie (**A.M.** 1907; Messrs. Dobbie).
65. White City, sent by Messrs. Sutton.

The following varieties which had previously obtained awards were included in the Trial:—18–23, Arran Chief (**A.M.** 1915); 38, Balgownie Seedling (**A.M.** 1911); 25, British Champion (**A.M.** 1908); 56, British Hero (**A.M.** 1905); 26, Dalhousie (**A.M.** 1905); 50, Devanha Seedling (**A.M.** 1908); 30, Dobbie's Prolific (**A.M.** 1911); 61, Duchess of Cornwall (**A.M.** 1905); 49, Dumfries Model (**A.M.** 1900); 60, Ellington's Prolific (**A.M.** 1901); 51, Erin's Queen (**A.M.** 1911); 13, 14, Great Scot (**A.M.** 1911); 52, Longkeeper (**A.M.** 1907); 59, Reading Giant (**F.C.C.** 1892); 82, 83, The Factor (**F.C.C.** 1905); 8, The Provost (**A.M.** 1907); 53, Toogood's Tremendous (**A.M.** 1911).

It will be noticed that only three of these were among those selected by the Committee in this Trial.

Varieties in the Trial.

Note.—The description will be found below in the section indicated by the letter following the name.

*1. Mauve Queen (*e*).
2. Kerr's Pink (*e*).
3. King of the Russets (*e*).
4., 5. The Lochar (*e*).
6. The Colleen (not true).
7. The Diamond (*d*).
8. The Provost (*d*).
9. Burnhouse Beauty (*d*).
10. The Chapman (*d*).
11. Isis (*d*).
12. Patagonian (*d*).
13., 14. Great Scot (*d*).
15. Burnhouse Beauty (*d*).
16. Culdees Castle (*d*).
17. Satisfaction (*d*).
18., 19., 20., 20A., 21., 22., 23. Arran Chief (*d*).

* See footnote, page 107.

24. Snowball (*d*).
25. British Champion (*d*).
26. Dalhousie (*d*).
27. Scottish Farmer (*d*).
28. Gordon Castle (*d*).
29. Table King (*a*).
30. Prolific (*d*).
31. King Albert (*d*).
32. Liberty (*d*).
33. Leinster Wonder.
34. Stourbridge Glory (*d*).
35. Industry (*d*).
36. Chieftain (*a*).
37. Prosperity (*e*).
38. Balgownie Seedling (*d*).
39. Irish Hero (*d*).
40. Sir Edward Carson (*d*).
41. Abundance (*d*).
42. Superlative (*d*).
43.* Hero King.
44. The Crofter (*d*).
45.* St. Giles.
46. The Admiral (*d*).
47. Vitality (*a*).
48. Royalty (*d*).
49. Dumfries Model (*d*).
50. Devanha Seedling (*d*).
51. Erin's Queen (*a*).
52. Longkeeper (*d*).
53. Tremendous (*d*).
54. Jones's Cropper (*d*).
55.* Ideal.
56. British Hero (*a*).
57. Red King (*c*).
58. Drumwhindle (*d*).
59. Reading Giant (*a*).
60. Prolific (Ellington's) (*a*).
61. Duchess of Cornwall (*d*).
62. Maincrop (*a*).
63. Goldfinder (*d*).
64. Mainstay (*a*).
65., 66., 67. White City (*a*).
68. Provider (not true).
69. Reliance (*a*).
70. Dover Castle (*a*).
71., 72., 73. Golden Wonder (*b*).
74., 75. Langworthy (*a*).
76. Rob Roy (*a*).
77. St. Andrews (*a*).
78. St. Cuthberts (*a*).
79. Golden Wonder (*b*).
80., 81. Up-to-Date (*d*).
82., 83. The Factor (*d*).
84. Mighty Atom (*a*).
85.* Sunbeam.
86. Defiance (*a*).
87., 88. King Edward VII. (*c*).
89. Irish Chieftain (*a*).
90. Leader (*c*).
91., 92. Cardinal (*c*).
93. Donside Defiance (*d*).
94.* Silver City.
95. Dargavel (*d*).
96. Scottish Farmer (*d*).

DESCRIPTIONS.

An endeavour has been made to group the varieties most nearly allied close together. Thus, very closely allied to 'Abundance' (No. 41) are Nos. 7, 'The Diamond'; 8, 'The Provost'; 12, 'Patagonian'; 16, 'Culdees Castle'; 31, 'King Albert'; 44, 'The Crofter'; and 46, 'The Admiral.' These are therefore grouped together (see also p. 120). Like them in most of its characters, but quite distinct in the colour of its flowers, is 'Burnhouse Beauty' (Nos. 9 and 15), and this is therefore placed near to the Abundance Group, but with spaces and rows of asterisks separating it from them and from the group which follows, and so on. The grouping adopted is at present purely tentative, but it is hoped to develop this method of classifying potatos further as opportunity occurs. We wish to place on record our thanks to Messrs. Bone, Lasham, and Snell in connexion with this work.

a. Tubers Kidney, White or Yellow.

59. Reading Giant (Fidler).—Plant dull green; haulm small, erect, green; foliage medium, wrinkled; flowers drop in bud; tubers

* These varieties appear to be earlier than maincrop varieties and are therefore omitted from the descriptions below.

kidney, medium to large; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 48 lb.

60. Ellington's Prolific (Ellington).—Characters as in 'Reading Giant,' but haulm tinged and more spreading. Crop, 49 lb. Not to be confused with Dobbie's 'Prolific,' No. 30.

* * * * * *

69. Reliance (Sutton).—Plant dark green, mottled yellow; haulm of medium size, spreading, slightly tinged; foliage medium, glossy, wrinkled; flowers many, white, persistent; tubers kidney, medium to large, smooth; eyes rather deep; eyebrows somewhat prominent; flesh white. Crop, 80 lb. (Ayrshire seed). Raised by Mr. J. Clark. Introduced by Messrs. Sutton, 1897.

* * * * * *

62. Maincrop (Carter).—Plant grey-green, mottled yellow; haulm of medium height, erect, green; foliage medium, wrinkled; flowers dropping in bud; tubers kidney, of medium size, smooth; eyes shallow; eyebrows rather prominent; flesh yellowish white. Crop, 62 lb. (N. Scotland seed).

74, 75. Langworthy (Dobbie, Simpson), No. 74, **XX** Sept. 5, 1916.—Plant yellowish green; haulm vigorous, erect, green; foliage medium, wrinkled; flowers mauve, tipped white, dropping; tubers kidney, medium size, smooth; eyes of medium depth; eyebrows rather conspicuous; flesh white. Crop, 69 lb. (East Lothian seed); 72 lb. (Dumfries seed). Raised by Mr. Niven.

* * * * * *

76 Rob Roy (R. Veitch), **XXX** Sept. 5, 1916.—Plant dark green; haulm vigorous, spreading, tinged; foliage large, more or less wrinkled; flowers mauve, whitish tipped with rose-purple streaks, dropping; tubers kidney, of medium size, smooth; eyes superficial, few; eyebrows fairly conspicuous; flesh white. Crop, 107 lb. (Scotch seed). Raised by Mr. McAlister.

* * * * * *

77. St. Andrews (*Dobbie*).—Plant yellowish green; haulm fairly vigorous, erect, some tinged; foliage medium, wrinkled, some curled; flowers white, some dropping; tubers medium to large, smooth; eyes superficial; eyebrows fairly conspicuous; flesh white. Crop, 42 lb. (Scotch seed). Raised by Messrs. Dobbie.

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78. St. Cuthberts (Dobbie).—Plant dark dull green; haulm vigorous, tinged, erect; foliage large, flat, somewhat glossy; flowers many, purple-streaked, semi-double, persistent; tubers kidney, medium to large, smooth; eyes shallow; eyebrows rather prominent; flesh yellowish. Crop, 86 lb. (Midlothian seed). Raised and introduced by Messrs. Dobbie, 'Snowball' × 'Myatt's Ashleaf.'

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89. Irish Chieftain (Lissadell), **XX** Sept. 5, 1916.—Plant grey green; haulm vigorous, erect, tinged; foliage large, flat; flowers many, pale mauve, tipped white, persistent; tubers pebble, medium, smooth

eyes rather deep; eyebrows prominent; flesh white. Crop, 82 lb. (Irish seed). Introduced by Lissadell; raised by Mr. McKenna of Manorhamilton, Co. Leitrim, and said to be a cross between 'Beauty of Hebron' and *Solanum Commersonii.*

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70. Dover Castle (Sutton).—Plant dull green; haulm of medium height, spreading, slightly tinged; foliage small, flat; flowers many, dropping without opening; tubers kidney or pebble, of medium size, smooth; eyes shallow; eyebrows inconspicuous; flesh lemon. Crop, 76 lb. (Perthshire seed). Raised by Rev. A. Paton. Introduced by Messrs. Sutton, 1913.

* * * * * *

47. Vitality (Martineau).—Plant grey-green; haulm of medium height, erect, green; foliage small, wrinkled or curled; flowers many, white, dropping; tubers pebble or kidney, medium, smooth; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 56 lb. (Berks seed).

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36. Chieftain (Webb).—Plant dull green; haulm of medium size, erect, more or less tinged; foliage medium, more or less wrinkled; flowers many, white, dropping; tubers, kidney and pebble, of medium size, rough; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 41 lb. (Kidderminster seed). Introduced by Messrs. Webb.

65, 66, 67. White City (Sutton, Simpson, Sydenham), No. 65, **XX** Sept. 5, 1916.—Flowers persistent, mauve, white-tipped; eyebrows somewhat more prominent; other characters as in 'Chieftain.' Crop, 74 lb. (Ayrshire seed); 77 lb. (Dumfries seed); 57 lb. (Lincolnshire seed). Raised by Mr. J. Stevenson. Introduced by Messrs. Sutton, 1909.

* * * * * *

29. Table King (Webb).—Plant dark green; haulm medium, erect, green; foliage medium, wrinkled; flowers few, persistent, white; tubers pebble, rough-skinned, medium to large; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop 74 lb. (Dumfries seed). Introduced by Messrs. Webb.

64. Mainstay (Carter).—Plant light green; haulm medium, spreading, green; foliage large, wrinkled; flowers few, persistent, white; tubers pebble and kidney, more or less rough, medium in size; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 59 lb. (Hertfordshire seed). Introduced by Messrs. Carter.

84. Mighty Atom (Barr).—Haulm tinged; foliage medium; flowers dropping, creamy white; tubers pebble, smooth; other characters as 'Mainstay.' Crop, 44 lb. (Lincolnshire seed). Introduced by Messrs. Marsh.

86. Defiance (Barr).—Flowers many, white, persistent; tubers pebble and kidney, more or less rough-skinned, otherwise like 'Mighty Atom.' Crop, 43 lb. (Lincolnshire seed). Raised by Mr. Butler. Introduced by Messrs. Marsh.

51. Erin's Queen (Sands).—Plant dark green; haulm fairly vigorous, erect to spreading, green; foliage medium, flattish; flowers few, dropping, unopened; tubers pebble and kidney, smooth; eyes rather prominent, few; eyebrows fairly conspicuous; flesh white. Crop 44 lb. (Irish seed).

b. Tubers Kidney, Brown.

71, 72, 73, 79. Golden Wonder (Barr, Dobbie, Simpson, Scarlett).—Plant dark green; haulm vigorous, erect, green; foliage medium, wrinkled; flowers many, mauve, white tipped, dropping; tubers kidney, brown, netted; eyes shallow; eyebrows rather prominent; flesh more or less yellowish white. Crop, 51 lb. (Buckinghamshire seed); 65 lb. (East Lothian seed); 78 lb. (Dumfries seed); 63 lb. (Scotch seed). Raised by Mr. Brown.

c. Tubers Kidney, Coloured.

87, 88. King Edward VII. (Barr, Dobbie), **XXX** Sept. 5, 1916.—Plant dark green; haulm vigorous, erect, tinged; foliage medium, wrinkled; flowers drop in bud; tubers white flushed, red round eyes, pebble, of medium size, smooth; eyes shallow; eyebrows rather prominent; flesh yellowish white. Crop, 63 lb. (Lincolnshire seed); 71 lb. Midlothian seed).

57. Red King (W. Robinson).—Characters as in King Edward VII., but tubers red all over. Crop, 52 lb. (Lancashire seed). A red sport from 'King Edward,' introduced by Mr. W. Robinson.

Note.—Through Mr. Cuthbertson's kindness we were able in 1917 to grow plants of each of these two forms from two different localities near Edinburgh, the crops produced confirming the comparative cropping powers as indicated by the figures given above. The crops were as follows:

		Locality I.	Locality II.
Light type (King Edward VII.)	Aver. of six tubers	4 lb. 6 oz.	3 lb. 14 oz.
Dark type (Red King)	,, ,,	3 lb. 12 oz.	3 lb. 8 oz.

* * * * * *

90. Leader (Veitch).—Plant dark green; haulm vigorous, erect, tinged; foliage large, flat; flowers many, dropping without opening; tubers red, flat kidney, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 54 lb. (Scotch seed).

* * * * * *

91, 92. Cardinal (Veitch, Carter).—Plant dark green; haulm straggling, purple; foliage small, wrinkled; flowers many, mauve, white-tipped, dropping; tubers medium, smooth; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 44 lb. (Scotch seed), 44 lb. (Scotch seed). Raised by Mr. McAlister. Introduced by Messrs. R. Veitch.

d. Tubers Round or Flat-round, White or Yellow.

13, 14. Great Scot (Barr, Veitch).—Plant dark green; haulm of medium height, more or less erect, tinged; foliage medium,

wrinkled; flowers white, many, dropping; tubers round, medium to large, mostly smooth; eyes rather deep; eyebrows somewhat prominent; flesh pale yellow. Crop, 68 lb. (Bucks seed); 88 lb. (Devon seed). Raised and introduced by Mr. McAlister.

* * * * * *

41. Abundance (Sutton).—Plant dark green; haulm vigorous, erect, tinged at nodes; foliage medium to large, flat; flowers few, white, persistent; tubers flat round, smooth, of medium size; eyes shallow, small; eyebrows inconspicuous; flesh white. Crop, 74 lb. (Perthshire seed). Raised by Mr. J. Clark. Introduced by Messrs. Sutton, 1886.

31. King Albert (Sands).—Plant dark green; haulm vigorous, erect, tinged; foliage medium, flat; flowers white, many, persistent; tubers flat round, large, smooth; eyes shallow, few; eyebrows more or less prominent; flesh pale yellowish white. Crop, 72 lb. (Irish seed). Raised and introduced by Mr. Sands. A cross between 'Abundance' and 'Leinster Wonder,' 1912.

16. Culdees Castle (Simpson).—Plant dull green; haulm vigorous, erect, green; foliage large, slightly wrinkled; flowers white, many, persistent; tubers round, large; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 82 lb. (Dumfries seed).

12. Patagonian (Dobbie).—Plant dark green; haulm more or less vigorous and erect, but plants not uniform, tinged; foliage medium, wrinkled; flowers white, many, persistent; tubers round or flat round, smooth, of medium size; eyes shallow; eyebrows inconspicuous; flesh white. Crops, 39 lb. (Midlothian seed). Imported from Patagonia.

8. The Provost (Dobbie), **XX** Sept. 5, 1916.—Plant dark green; haulm vigorous, erect; foliage medium, somewhat wrinkled; flowers white, few, persistent; tubers flat round, slightly russeted, medium to large; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 95 lb. (East Lothian seed). Raised and introduced by Messrs. Dobbie.

7. The Diamond (Barr).—Plant dull green; haulm vigorous, erect, tinged above nodes; foliage medium, somewhat wrinkled; flowers white, many, persistent; tubers flat round, smooth, of medium size; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 61 lb. (Dumfries seed). Introduced by Messrs. Johnson.

44. The Crofter (Veitch).—Plant dull green; haulm vigorous, erect, green; foliage medium, flat; flowers white; tubers round or flat round, smooth, of medium size; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 76 lb. (Dumfries seed).

46. The Admiral (Dobbie).—Plant dark green; haulm vigorous, more or less erect, tinged in leaf axil; foliage medium, wrinkled; flowers white, many, persistent; tubers flat round, smooth, of medium size; eyes shallow, few; eyebrows inconspicuous; flesh white. Crop, 75 lb. (W. Lothian seed). Raised by Mr. T. Chapman. Introduced by Messrs. Dobbie.

9, 15. Burnhouse Beauty (Dobbie, Simpson).—Plant yellowish green; haulm of medium height, erect, green or very slightly tinged; foliage medium, wrinkled; flowers mauve, few, dropping; tubers pebble-shaped, of medium size, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 63 lb. (W. Lothian seed); 64 lb. (Dumfries seed). Raised by Mr. J. Wolfe. Introduced by Messrs. Dobbie.

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18, 19, 20, 20A, 21, 22, 23.—Arran Chief (Dobbie, Veitch, Barr, A. Dickson, Simpson, Sydenham, Carter), No. 18, **XX** Sept. 5, 1916.—Plant dark green; haulm vigorous, erect, tinged; foliage medium to large, more or less wrinkled; flowers white, many dropping; tubers flat round, generally smooth, medium to large; eyes mostly shallow; eyebrows inconspicuous; flesh white or faintly tinged. Crop, 79 lb. (S), 71 lb. (S), 61 lb. (E), 76 lb. (I), 78 lb. (S), 48 lb. (E), 76 lb. (S) respectively. (S = Scotch, E = English I = Irish seed.) Raised by Mr. McKelvie.

* * * * * *

40. Sir Edward Carson (Sands).—Plant dark green; haulm vigorous, erect, green; foliage large, flat; flowers white, many, persistent; tubers pebble-shaped, of medium size, smooth; eyes shallow; eyebrows prominent; flesh white. Crop, 71 lb. (Irish seed).

48. Royalty (Carter).—Plant dark green; haulm of medium height, erect, tinged; foliage medium, flattish, glossy; flowers white, many, persistent; tubers round or flat-round, medium to large, skin somewhat netted; eyes rather deep; eyebrows fairly prominent; flesh white. Crop, 76 lb. (W. Scotland seed). Introduced by Messrs. Carter.

* * * * * *

27, 96. Scottish Farmer (Kent & Brydon).—Plant dull green; haulm of medium height, erect, tinged; foliage large, wrinkled; flowers many, mauve, tipped white, persistent; tubers round, of medium size, smooth; eyes rather deep; eyebrows rather prominent; flesh white. Crop, 53 lb., 59 lb. (Forfarshire seed). Introduced by Kent & Brydon.

* * * * * *

35. Industry (Webb).—Plant dark green; haulm more or less vigorous, spreading, tinged; foliage medium, flat; flowers few, dropping without opening; tubers round and pebble, medium, smooth; eyes rather deep; eyebrows rather prominent; flesh yellowish white. Crop, 58 lb. (Dumfries seed). Introduced by Messrs. Webb.

17. Satisfaction (Sutton).—Plant dark green; haulm of medium height, erect, tinged; foliage medium, wrinkled; flowers many, pale lilac, tipped white, persistent; tubers pebble, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 71 lb. (Ayrshire seed). Raised by Mr. Clark. Introduced by Messrs. Sutton.

24. Snowball (Carter).—Plant dull green; haulm of medium size, tinged, erect; foliage medium, wrinkled; flowers few, dropping in bud; tubers round, medium, smooth; eyes shallow; eyebrows rather prominent; flesh white. Crop, 64 lb. (North Scotland seed). Introduced by Messrs. Carter.

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50. Devanha Seedling (Smith).—Plant dark green; haulm vigorous, erect, tinged; foliage large, flat; flowers few, dropping in bud; tubers round and pebble, medium, smooth; eyes rather deep; eyebrows fairly prominent; flesh yellowish white. Crop, 78 lb. (Scotch seed).

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10. The Chapman (Dobbie), **XX** Sept. 5, 1916.—Plant dark green; haulm vigorous, tinged, erect; foliage large, more or less wrinkled; flowers mauve, tipped white, more or less persistent; tubers pebble and round, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 98 lb. (West Lothian seed). Raised by Mr. T. Chapman. Introduced by Messrs. Dobbie.

26. Dalhousie (Kent & Brydon).—Plant dull green; haulm of medium height, spreading; other characters as in 'The Chapman.' Crop, 64 lb.

49. Dumfries Model (Kerr).—Plant yellowish green; haulm of medium height, more or less spreading; eyes and eyebrows rather more pronounced. Other characters as in 'The Chapman.' Crop, 85 lb.

80, 81. Up-to-Date (Simpson, Barr).—Foliage flattish; tubers kidney or pebble; eyebrows rather prominent. Other characters as in 'The Chapman.' Crop, 96 lb. (Dumfries seed); 83 lb. (Dumfries seed). Raised by Mr. Findlay.

82, 83. The Factor (Barr, Dobbie), **XX** Sept. 5, 1916.—Characters as in 'Up-to-Date.' Crop, 58 lb. (Lincolnshire seed); 89 lb. (East Lothian seed). Raised by Mr. Chapman. Introduced by Messrs. Dobbie.

93. Donside Defiance (Cook), **XXX** Sept. 5, 1916.—Characters as in 'Up-to-Date.' Crop, 102 lb. (Aberdeen seed). Raised by Mr. David Cook from seed of 'Reading Russet,' 1912.

52. Longkeeper (Carter).—Characters as in 'Up-to-Date.' Crop, 109 lb.

53. Tremendous (Toogood).—Characters as in 'Up-to-Date.' Crop, 61 lb.

54. Cropper (Jones), **XX** Sept. 5, 1916.—Characters as in 'Up-to-Date.' Crop, 105 lb. (Irish seed). Introduced by Mr. Anketell-Jones.

56. British Hero (Carter).—Plant dull green; haulm faintly tinged; flowers dropping; eyebrows inconspicuous; other characters as in 'Up-to-Date.' Crop, 65 lb.

25. British Champion (Carter).—Plant grey green; haulm of medium height, tinged, rather spreading; foliage medium, wrinkled;

flowers as in 'Up-to-Date'; tubers pebble and kidney; medium to large, smooth; eyes shallow; eyebrows rather prominent; flesh white. Crop, 47 lb.

34. Stourbridge Glory (Webb).—Haulm green, erect; foliage large, flattish; other characters as in 'British Champion.' Crop, 54 lb. (Kidderminster seed). Introduced by Messrs. Webb.

42. Superlative (Sutton), **XX** Sept. 5, 1916.—Haulm erect; foliage medium, flattish; eyebrows inconspicuous; other characters as in 'British Champion.' Crop, 65 lb. (Perthshire seed). Raised by Mr. W. Coleman. Introduced by Messrs. Sutton.

30. Prolific (Dobbie), **XX** Sept. 5, 1916.—Plant dark green; haulm of medium height, tinged, erect; foliage medium, more or less wrinkled; flowers as in 'Up-to-Date'; tubers as in 'Superlative.' Crop, 69 lb. (East Lothian seed). Introduced by Messrs. Dobbie.

32. Liberty (A. Dickson).—Foliage flattish; other characters as in 'Prolific.' Crop, 77 lb. (Co. Down seed). Raised and introduced by Messrs. A. Dickson.

38. Balgownie Seedling (Yule).—Plant dull green; haulm vigorous, erect; eyes rather deep; flesh lemon; other characters as in 'British Champion.' Crop, 71 lb. (Scotch seed).

58. Drumwhindle (Gavin).—Foliage flattish; eyes shallow; flesh white; other characters as in 'Balgownie Seedling.' Crop, 112 lb. (Scotch seed).

61. Duchess of Cornwall (Williamson).—Plant rather light green; flesh yellowish white; other characters as in 'British Champion.' Crop, 80 lb. (Irish seed).

95. Dargavel (Kerr).—Plant dark shining green; foliage large, flattish, somewhat glossy; haulm, flower and tuber characters as in 'Up-to-Date.' Crop, 98 lb. (Dumfries seed).

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28. Gordon Castle (Sutton).—Plant dark green; haulm of medium height, spreading, green; foliage medium, wrinkled, glossy; flowers few, dropping in bud; tubers pebble, of medium size, smooth; eyes shallow; eyebrows rather prominent; flesh white. Crop, 60 lb. (Perthshire seed). Raised by Rev. Aikman Paton. Introduced by Messrs. Sutton.

63. Goldfinder (Carter).—Characters as in 'Gordon Castle,' but stem tinged at node; foliage flatter and less glossy; tubers pebble and kidney. Crop, 65 lb. (N. Scotch seed). Introduced by Messrs. Carter.

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39. Irish Hero (Sands).—Plant dull green; haulm of medium height, erect, green; foliage medium, wrinkled; flowers many, white, dropping; tubers pebble and round, medium, rough-skinned; eyes and eyebrows rather prominent; flesh white. Crop, 75 lb. (Irish seed). Raised and introduced by Mr. Sands. 'Sharpe's Express' × 'Abundance.'

11. Isis (Dobbie).—Plant dull green; haulm vigorous, erect, tinged; foliage medium, wrinkled; flowers white, small, many, persistent; tubers round, some irregular, rough, netted; eyes rather deep; eyebrows fairly conspicuous; flesh yellowish white. Crop 63 lb. (Midlothian seed). Raised by Mr. Brown.

e. Tubers Round, Coloured.

2. Kerr's Pink (Dobbie).—Plant dull green; haulm vigorous, erect, tinged; foliage large, flat; flowers many, white, dropping; tubers round, pink, medium, rough-skinned; eyes variable; eyebrows inconspicuous; flesh yellowish white. Crop, 86 lb. (Scotch seed).

3. King of the Russets (Carter).—Plant dark green; haulm of medium size, erect, tinged; foliage medium, more or less wrinkled; flowers many, white, persistent; tubers round, pink, of medium size, rough; eyes of medium depth; eyebrows rather prominent; flesh yellowish white. Crop, 49 lb. (Herefordshire seed). Introduced by Messrs. Carter.

33. Leinster Wonder (Martineau).—Plant dull green; haulm small, erect, tinged; foliage medium, wrinkled; flowers and tubers as in 'King of the Russets.' Crop, 47 lb. (Berkshire seed).

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4, 5. The Lochar (Dobbie, Veitch).—Plant dull green; haulm vigorous, erect, green; foliage medium, wrinkled; flowers white, many, dropping; tubers round, slightly flushed pink round eye, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish; Crop, 105 lb. (Scotch seed), 76 lb. (Dumfries seed). Raised by Mr. Farish.

37. Prosperity (Webb).—Haulm tinged; eyes rather deeper, and eyebrows somewhat prominent. Otherwise like 'The Lochar.' Crop, 92 lb. (Dumfries seed). Introduced by Messrs. Webb.

* * * * * *

1. Mauve Queen (Dobbie).—Plant dull green; haulm of medium height, erect, tinged; foliage medium, wrinkled and curled; flowers few, white, persistent; tubers flat-round and pebble, mauve, smooth, of medium size; eyes and eyebrows variable; flesh purple. Crop, 27 lb. (Scotch seed). Raised by Mr. R. Scarlett. Introduced by Messrs. Dobbie.

SHALLOTS AT WISLEY, 1917.

Five stocks of bulbs and one of Shallot seeds were sent in for trial in 1917. Judging from the samples received, large bulbs appear to be in demand instead of the smaller, true Shallot. The larger—forms probably of the Jersey Shallot—do not appear to keep quite so well as the smaller ones, which are, after the outer coats are removed, so useful for pickling, and keep with little trouble in a cool dry place until May, and are thus useful for seasoning practically the year round. Shallots succeed where onions fail owing to the onion maggot. This pest rarely attacks Shallots, and Shallots are of very easy cultivation. Planting should be done in January, the bulbs being merely pushed into the ground, not covered with soil; they should be harvested in July as soon as the leaves die off, thoroughly dried, and stored in shallow boxes.

1, 5.* Exhibition Purple (R. Veitch).—Bulb very large, oval, heavy; of a purplish-red colour; producing an average of 7 to a plant. Stock good. The same variety under No. 5 was grown from seed and came true, but gave a very poor plant.

2. Giant Red Exhibition (Simpson).—Bulbs variable, of small to medium size, flattened oval, light; of a reddish-brown colour. Stock uneven.

3. Large Red Exhibition (Dobbie).—Bulb very large, oval, heavy; of shining purplish-red colour; producing an average of 7 to a plant. Stock good.

6. Selected Large Red (Stokes).—Bulbs of medium to large size, oval, fairly heavy; of a reddish-brown colour; producing 6 to 8 to a plant. Stock fairly good.

4. Yellow-skinned (Simpson).—Bulb of medium size, flattened oval, heavy; of a brownish-yellow colour; producing good clusters. Stock good.

* See footnote, p. 107.

AUTUMN-SOWN ONIONS AT WISLEY, 1916–17.

EIGHTY-SEVEN packets of Onion seed were sent in for sowing in autumn 1916. The seed was sown on August 23 on ground occupied earlier in the year by the mid-season pea trial. It was dug over and received a moderate dressing of farmyard manure before the seed was sown. The drills were made 15 inches asunder, and, with the exception of two stocks, the germination was excellent. The seedlings remained in this bed until early March 1917, when they were transplanted into land similarly treated, except that it had been dug in September and remained rough all winter. Two rows of each variety were planted 8 inches apart, fifty plants in a row, and the rows 15 inches apart; the remainder were allowed to stand in the seed-bed after thinning out. Little growth was made by the transplanted plants until late April, after which they grew away well. Most stocks bolted into flower, however, whether transplanted or not, the least prone to it being Nos. 1, 3, 5, 12–17, 39, 40, 58, 59, 61, 69, 70, 80–83, mainly Tripoli onions, but including 'Autumn Triumph,' 'Record,' and 'Froxfield.' This had little effect on the crop, however, for the tops of the flowering shoots were promptly pinched out and most of the plants made splendid bulbs.

While the spring-sown Onions on an adjacent plot suffered badly from an attack of Onion fly, this pest was not seen on this plot, a point greatly in favour of the autumn-sowing of Onions; nor did Onion mildew give any trouble.

A feature of the trial was the number of seeds from American sources which were included. On the whole, the plants derived from these tended to ripen off somewhat sooner than those of the same type from English seed, but there was no great difference in the crops, and the bulbs from American seed kept as well as those from English. Many of the varieties included in the trial are of course not fit for storing, but are grown to be used either while still young and green, like the 'White Lisbon,' or immediately they are large enough. They are in fact best regarded as varieties suitable for bridging the gap between the stored Onions of the previous year and the new crop. None of the white-skinned Onions kept for any length of time after harvesting, and though the Tripoli type of Onion gives a heavy crop, it is better to choose some other type for storing for winter and early spring use.

The Fruit and Vegetable Committee examined the trial on July 27, and selected the following for the award indicated:

Award of Merit.

40. Autumn Triumph, from Mr. Beckett.
70. Froxfield, from Messrs. Barr.

83. Mammoth Red Tripoli, from Messrs. Webb.

11. White Leviathan, from Messrs. Sutton.

23. Yellow Rocca, from Messrs. Harrison.

Highly Commended.

48. Ailsa Craig, from Messrs. Wilson.

5. Covent Garden, from Messrs. Barr.

30, 31. Cranston's Excelsior, from Messrs. Barr and Messrs. Wilson (**A.M.** 1907 (Barr, Carter, Nutting, Veitch)).

59. Giant Globe Rocca, from Messrs. Barr.

20, 21, 22. Giant Lemon Rocca, from Messrs. Sutton, Nutting, and Webb.

56. Giant Rocca Tripoli, from Messrs. Sydenham.

79. Red Italian Tripoli, from Messrs. Nutting.

32, 33. Trebons, from Messrs. Barr and Messrs. Nutting (**F.C.C.** 1876 (Barr, Stuart & Mein, Vilmorin)).

15. White Italian Tripoli, from Messrs. Veitch.

8. White Spanish, selected, from Messrs. Barr.

Commended.

47, 49, 53. Ailsa Craig, from Messrs. Harrison, R. Veitch, and Sutton.

82. Bassano Tripoli, from Messrs. Veitch.

39. Giant Zittau, from Messrs. Harrison (**F.C.C.** 1880 (Benary)).

25. The Sutton Globe, from Messrs. Sutton.

12. White Emperor, from Messrs. Carter.

13. White Italian, from Messrs. Harrison.

Where an award had been made in earlier years to one of the varieties now selected by the Committee, it is indicated in parentheses with the date and sender. Where certain stocks only of those sent for trial of one variety are indicated, the Committee selected those stocks as the best of the variety; *e.g.* there were ten stocks named ' Ailsa Craig ' (Nos. 45 to 54) sent for trial, one of which (No. 54) proved to be a splendid stock of an Onion of the white Spanish type; and one (No. 45) was slightly different in the form of the bulb from the rest; of the others the Committee selected Messrs. Wilson's stock (No. 48) as the best, recommending the award of Highly Commended, and Nos. 47, 49, and 53, from Messrs. Harrison, R. Veitch, and Sutton respectively, for commendation, passing over Nos. 46, 48, 50, 51, 52 as being somewhat less good in some particular. A similar thing occurred with several other varieties.

The following varieties which had received awards in earlier trials were represented but not considered on this occasion equal to those mentioned in the foregoing list: ' Crimson Globe ' (87), ' Nuneham Park ' (64), ' Rousham Park Hero ' (71), ' Sutton's A1 ' (65), ' Southport Red Globe ' (86), ' Southport Yellow Globe ' (18).

The crop weight given below is that from the transplanted plants, and is usually the weight of 100 plants. The bulbs of those left where they were sown were scarcely less good, but the number of plants left in

these rows varied, and there was rather more irregularity in the size of the bulbs.

As suggested above, the keeping qualities of Onions are among the most important points to the cultivator. Some of those in the trial are of value only in the summer and early autumn, while others keep well on into the spring. An endeavour has been made to indicate the relative keeping qualities in the following table, where the figure 3 in the column indicates that the variety was still very good at the date given at the top of the column, 2 that it was still usable, 1 that many were past use, and — that none had kept until this date. It will be seen that some stocks of certain varieties proved to be better keepers than others with the same name.

Varieties and Keeping Qualities.

No.	Variety.	Oct. 15.	Nov. 15.	Dec. 1.	Dec. 15.	Jan. 1.	Jan. 15.	Feb. 15.
*1	Early White Marzaiola Tripoli	—	—	—	—	—	—	—
2	White Lisbon	—	—	—	—	—	—	—
3	Early White Barletta	—	—	—	—	—	—	—
4	Early Golden Gem	3	3	3	3	3	2	2
5	Covent Garden Silver-skinned Pickling	—	—	—	—	—	—	—
6	Silver Globe	—	—	—	—	—	—	—
7	Southport White Globe	—	—	—	—	—	—	—
8	White Spanish Selected	3	3	3	3	3	3	3
9	White Portugal	—	—	—	—	—	—	—
10	Large Silver Flat	—	—	—	—	—	—	—
11	White Leviathan	—	—	—	—	—	—	—
12	White Emperor	—	—	—	—	—	—	—
13	White Italian	—	—	—	—	—	—	—
14	Monster White Tripoli	—	—	—	—	—	—	—
15	White Italian Tripoli	—	—	—	—	—	—	—
16	Large White Italian Tripoli	—	—	—	—	—	—	—
17	Giant White Italian Tripoli	—	—	—	—	—	—	—
18	Southport Yellow Globe	3	3	3	3	3	3	3
19	Straw-coloured Rocca	1	—	—	—	—	—	—
20	Giant Lemon Rocca	—	—	—	—	—	—	—
21	Lemon Rocca	—	—	—	—	—	—	—
22	Giant Rocca Lemon Coloured	—	—	—	—	—	—	—
23	Yellow Rocca	1	—	—	—	—	—	—
24	Up-to-Date Selected	3	3	3	3	3	3	3
25	The Sutton Globe	3	3	3	3	3	3	3
26	Ohio Yellow Globe	3	3	3	3	3	3	3
27	Masterpiece	2	1	1	—	—	—	—
28	Cranston's Excelsior	3	2	1	—	—	—	—
29		3	3	3	3	3	3	2
30		2	2	1	—	—	—	—
31		2	2	1	—	—	—	—
32	Trebons	3	3	2	2	2	1	—
33		3	3	3	3	3	3	2
34	Danvers' Yellow Globe	3	3	3	3	3	3	3
35	Danvers' Yellow Flat	3	3	3	3	3	3	2
36	Reliance	3	3	3	3	3	3	3
37	Giant Yellow Zittau	3	3	3	3	3	3	3
38	Zittau Giant	3	2	2	1	1	1	—
39	Giant Zittau	3	3	3	3	3	3	3
40	Autumn Triumph	3	3	3	3	3	3	3
41	Perfection	3	3	3	3	2	2	2

* See footnote, p. 107.

No.	Variety.	Oct. 15.	Nov. 15.	Dec. 1.	Dec. 15.	Jan. 1.	Jan. 15.	Feb. 15.
42	Giant Gibraltar	—	—	—	—	—	—	—
43	Yellow Dutch or Strasburg	3	2	2	1	1	—	—
44	Prizetaker	3	2	2	1	1	1	—
45	Ailsa Craig "true type"	3	2	2	2	2	2	2
46	Ailsa Craig, reselected	3	2	2	2	2	2	1
47	Ailsa Craig, reselected	3	2	2	2	1	1	—
48	Ailsa Craig, reselected	3	3	2	1	1	—	—
49	Ailsa Craig, reselected	3	3	2	2	1	1	—
50	Ailsa Craig, reselected	2	1	1	—	—	—	—
51	Ailsa Craig, reselected	3	3	2	2	2	2	1
52	Ailsa Craig, reselected	3	3	3	3	2	2	2
53	Ailsa Craig (Sutton's Selected)	3	3	2	2	2	2	1
54	Wrongly named	3	2	2	2	2	1	—
55	Gloucester Mammoth	2	2	2	1	1	1	—
56	Giant Rocca Tripoli	1	1	—	—	—	—	—
57	Giant Rocca	2	1	1	—	—	—	—
58	Giant Rocca	3	2	1	1	—	—	—
59	Giant Globe Rocca	2	1	1	—	—	—	—
60	Giant Rocca	2	1	1	—	—	—	—
61	Giant Rocca	2	2	2	1	—	—	—
62	Bedfordshire Champion (Sutton's Strain)	3	3	3	3	3	3	3
63	Bedfordshire Champion, Selected	3	3	3	3	3	3	3
64	Nuneham Park	3	3	3	3	3	3	3
65	Sutton's A1	3	3	3	3	3	3	3
66	Magnum Bonum Improved	3	3	3	2	2	2	2
67	White Spanish (Sutton's Strain)	3	3	3	3	3	3	2
68	Improved Reading	3	3	3	3	3	3	2
69	Record	2	1	—	—	—	—	—
70	Froxfield	3	3	3	3	3	3	3
71	Rousham Park Hero	3	3	3	3	3	3	3
72	Brown Globe	3	3	3	3	3	3	3
73	Australian Brown	3	3	3	3	3	3	3
74	Barr's Long-Keeper	3	3	3	3	3	3	2
75	Sutton's Long-Keeping	3	3	3	3	3	3	3
76	James' Long-Keeping	3	3	3	3	3	3	3
77	Extra Early Red Flat	3	3	2	2	2	1	1
78	Red Wethersfield	3	3	3	2	2	1	—
79	Red Italian Tripoli	2	1	—	—	—	—	—
80	Large Red Italian	2	1	—	—	—	—	—
81	Red Italian	—	—	—	—	—	—	—
82	Bassano Tripoli	2	1	—	—	—	—	—
83	Mammoth Red Tripoli	2	1	1	1	—	—	—
84	Giant Red Garganus	2	1	1	—	—	—	—
85	Flat Red Genoa	2	1	1	—	—	—	—
86	Southport Red Globe	3	3	3	3	3	2	1
87	Crimson Globe	3	3	3	3	2	2	2

I. White Varieties.

(*a*) *Bulbs flat-round.*

3. Early White Barletta (Nutting).—Bulb medium to large; fairly solid; outer skin white, inner greenish. Crop, 22 lb.; rather uneven.

1. Early White Marzaiola Tripoli (Nutting).—Bulb medium to large; fairly solid; outer skin white, inner greenish. Crop, 15 lb.; fairly even. Kept better than many white forms.

17. Giant White Italian Tripoli (Sydenham).—Bulb large; solid; outer skin white, inner greenish. Crop, 30½ lb.; fairly even. Two brown rogues.

10. Large Silver Flat (Barr).—Bulb medium; fairly solid; outer skin yellowish white, inner greenish. Crop, 26 lb.; fairly even.

16. Large White Italian Tripoli (Nutting).—Bulb medium to large; fairly solid; outer skin yellowish white, inner greenish. Crop, 17½ lb.; rather uneven.

14. Monster White Tripoli (Webb).—Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 31½ lb.; even.

12. White Emperor (Carter), **XX** July 27, 1917.—Bulb fairly large; solid; outer skin yellowish white, inner greenish. Crop, 33 lb.; even. Two brown rogues.

13. White Italian (Harrison), **XX** July 27, 1917.—Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 30 lb.; even.

15. White Italian Tripoli (R. Veitch), **XXX** July 27, 1917.—Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 31 lb.; even. Stock true.

11. White Leviathan (Sutton), **A.M.** July 27, 1917. Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 43½ lb., even, true.

9. White Portugal (Morse).—Bulb small to medium; not very solid; outer skin yellowish white, inner greenish. Crop, 19½ lb.; rather uneven.

(*b*) *Bulbs oval.*

5. Covent Garden (Silver-skinned Pickling) (Barr), **XXX** July 27, 1917.—Bulb medium to large; flattish oval; solid; outer skin white, inner greenish. Crop, 24½ lb.; fairly even.

6. Silver Globe (Barr).—Bulb medium; flattish oval; fairly solid; outer skin white, inner greenish. Crop, 24 lb.; rather uneven.

7. Southport White Globe (Morse).—Bulb small to medium; rather soft; outer skin white, inner greenish. Crop, 13 lb.; uneven; some flat.

2. White Lisbon (Harrison).—Bulb large; flattish oval; solid; outer skin white, inner greenish. Crop, 35½ lb.; mixed. Nine brownish rogues.

II. Yellow Varieties.

(*a*) *Bulbs flat.*

37, 38, 39. Giant Yellow Zittau (R. Veitch, Barr, Harrison), No. 39, **XX** July 27, 1917.—Bulb medium to large; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 28½ lb., 39 lb., 46½ lb., even. No. 37 was thicker-necked and contained some reddish rogues and No. 38 contained some oval bulbs.

68. Improved Reading (Sutton).—Bulb medium; fairly solid;

outer skin dark straw-yellow, inner greenish yellow. Crop, 39½ lb.; fairly even.

64. Nuneham Park (Barr).—Bulb medium; fairly solid; outer skin dark straw-yellow, inner yellow. Crop, 26½ lb.; even.

36. Reliance (Webb).—Bulb medium; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 28½ lb.; mixed, mostly flat-round.

67. White Spanish (Sutton).—Bulb medium; fairly solid; outer skin dark straw-yellow, inner yellow. Crop, 28 lb.; fairly even.

8. White Spanish Selected (Barr), **XXX** July 27, 1917.—Bulb large; solid; outer skin brownish yellow, inner yellow-green. Crop, 47½ lb.; even. Good stock.

35. Yellow Danvers' Flat (Morse).—Bulb medium; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 27½ lb.; fairly even; a few brownish-red rogues. Not unlike 8 but smoother.

43. Yellow Dutch or Strasburg (Morse).—Bulb small to medium; rather soft; outer skin straw-yellow, inner yellow. Crop, 19 lb.; uneven.

(*b*) *Bulbs oval.*

65. A1 (Sutton).—Bulb medium to large; solid; outer skin dark straw-yellow, inner yellow. Crop, 35 lb.; even, some flattish, rather long-necked.

45, 46, 47, 48, 49, 50, 51, 52, 53. Ailsa Craig (Watkins & Simpson, Carter, Harrison, Wilson, R. Veitch, Nutting, Barr, Morse, Sutton), No. 48, **XXX** Nos. 47, 49, and 53, **XX** July 27, 1917.—Bulb medium to large; solid; outer skin straw-yellow to dark straw-yellow, inner greenish yellow and yellow. Crop, 45½ lb., 44 lb., 51 lb., 54 lb., 52 lb., 45 lb., 45 lb., 47½ lb., 41½ lb.; fairly even to even. Nos. 45, 50, and 51 contained some bulbs of a flatter type, and Nos. 46 and 52 were not quite true to colour and shape. No. 45, which was sent as the "true type," was somewhat flattened on one side near the base in many cases, while the remainder were uniformly round. No. 53 was a taller form than the others.

40. Autumn Triumph (Beckett), **A.M.** July 27, 1917.—Bulb large; very solid; outer skin dark straw colour, inner greenish yellow. Crop, 60½ lb.; even. Very good stock. Raised by Mr. A. Hubbard, introduced by Mr. Edwin Beckett.

62, 63. Bedfordshire Champion (Sutton, Barr).—Bulb medium; fairly solid; outer skin straw-yellow, inner greenish yellow. No. 62 a good stock. Crop, 39 lb.; even. No. 63 uneven, mixed, and darker in colour. Crop, 33½ lb.

28, 29, 30, 31. Cranston's Excelsior (Nutting, Watkins & Simpson, Barr, Wilson), Nos. 30 and 31, **XXX** July 27, 1917.—Bulb medium to large; solid; outer skin dark straw-yellow, inner greenish yellow. Crop, 46 lb., 40½ lb., 54½ lb., 48½ lb. Nos. 28 and 29 were flatter bulbs, and No. 30 deeper in colour. The Committee considered there

was practically no difference between this and most forms of 'Ailsa Craig,' *q.v.*

34. Danvers' Yellow Globe (Morse).—Bulb medium; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 25½ lb.; uneven. Mixed, poor, several red.

4. Early Golden Gem (Barr).—Bulb small to medium; flattish oval; rather soft; outer skin white and golden brown, inner greenish striped. Crop, mixed in size and colour. Germination poor.

42. Giant Gibraltar (Carter).—Bulb medium to large; fairly solid; flattish oval; outer skin straw-yellow, inner yellow. Crop, 44 lb.; fairly even. Mixed, good many reds.

20, 21, 22, 23. Giant Lemon Rocca (Sutton, Nutting, Webb, Harrison), No. 23, **A.M.** Nos. 20, 21, and 22, **XXX** July 27, 1917.—Bulb large; solid; flattish oval; outer skin straw-yellow, some reddish brown, inner greenish yellow. Crop, 65 lb., 60½ lb., 61 lb., 56½ lb.; even.

56, 57, 58, 59, 60, 61. Giant Rocca Tripoli (Sydenham, Webb, Nutting, Barr, Harrison, R. Veitch), Nos. 56 and 59, **XXX** July 27, 1917.—Bulb large; solid; some flattish oval; outer skin brown and reddish, inner white, greenish yellow and reddish. Crop, 63 lb., 69½ lb., 59 lb., 69½ lb., 53½ lb., 59½ lb.; rather uneven. Nos. 57, 58, 60, and 61, mixed, some white.

55. Gloucester Mammoth (Wheeler).—Bulb small to medium; rather soft; outer skin dark straw to brown, inner greenish yellow. Crop, 56 lb.; fairly even. Raised and introduced by Messrs. J. C. Wheeler, of Gloucester, 1914.

66. Magnum Bonum Improved (Barr).—Bulb medium; fairly solid; outer skin dark straw-yellow, inner greenish yellow. Crop, 34 lb.; even. Mixed.

27. Masterpiece (Webb).—Similar to Cranston's Excelsior. Crop, 44½ lb.

26. Ohio Yellow Globe (Morse).—Bulb medium to large; fairly solid; outer skin dark straw-yellow, inner greenish. Crop, 33 lb. Not very good stock, rather thick-necked.

41. Perfection (Sutton).—Bulb medium; fairly solid; outer skin straw-yellow or yellow, inner greenish yellow. Crop, 62½ lb.; even, rather thick-necked.

44. Prizetaker (Morse).—Bulb medium; solid; flattish oval; outer skin dark straw-yellow, inner yellow. Crop, 42 lb.; even.

69. Record (Carter).—Bulb medium to large; solid; outer skin brownish, tinged red; inner white, yellow and reddish. Crop, 47½ lb.; mixed, some white.

18. Southport Yellow Globe (Morse).—Bulb medium; variable, some solid, some loose; outer skin yellow-brown, inner greenish, some reddish. Crop, 22½ lb.; uneven, some fairly heavy.

19. Straw-coloured Rocca (R. Veitch).—Bulb large; solid; outer skin straw-yellow, some reddish, inner greenish yellow. Crop, 55½ lb.; uneven. Rather mixed, some reddish, rather thick-necked.

25. The Sutton Globe (Sutton), **XX** July 27, 1917.—Bulb medium; fairly solid; outer skin dark straw-yellow, inner greenish. Crop, 43½ lb.; even.

32, 33. Trebons (Barr, Nutting), **XXX** July 27, 1917.—Bulb large; solid; outer skin dark straw colour, inner greenish yellow. Crop, 61½ lb., 60½ lb.; even. No. 33 a very good stock.

24. Up-to-Date Selected (Barr).—Bulb medium; fairly solid; outer skin dark straw, inner yellow. Crop, 32 lb.; uneven. Not true, some red flat.

III. Brown Varieties.

(*a*) *Bulbs flat.*

71. Rousham Park Hero (Barr).—Bulb medium; fairly solid; outer skin brown, inner yellow. Crop, 24½ lb.; uneven.

(*b*) *Bulbs oval.*

73. Australian Brown (Morse).—Bulb small to medium; rather loose; outer skin brown and red, inner greenish yellow and red. Crop, 23 lb.; rather uneven.

72. Brown Globe (Morse).—Bulb small to medium; rather loose; outer skin brown, inner greenish yellow. Crop, 24½ lb.; fairly even. Some reddish.

70. Froxfield (Barr), **A.M.** July 27, 1917.—Bulb medium; fairly solid; outer skin brown, inner yellow. Crop, 45½ lb.; even. A very true and even stock, but rather variable in shape.

76. James' Long-Keeping (Barr).—Bulb medium; fairly solid; outer skin reddish brown, inner yellow-green tinged golden. Crop, 29½ lb.; fairly even.

74. Long-Keeper (Barr).—Bulb small to medium; rather loose; outer skin brown, inner yellow. Crop 18 lb., rather uneven, some reddish.

(*c*) *Bulbs coconut-shaped.*

75. Long-Keeping (Sutton).—Bulb medium; fairly solid; outer skin reddish brown, inner greenish yellow. Crop, 33½ lb.; even.

IV. Red Varieties.

(*a*) *Bulbs flat.*

82, 83. Bassano Tripoli (R. Veitch, Webb).—No. 82 **XX**, No. 83, **A.M.** July 27, 1917.—Bulb large; solid; outer skin red-purple, inner red-purple; flesh white, tinged at margins. Crop, 52 lb., 55 lb.; fairly even.

77. Extra Early Red Flat (Morse).—Bulb medium; solidity variable; outer skin dark purple-red, inner reddish; flesh white, tinged at margins. Crop, 20½ lb.; uneven.

84, 85. Flat Red Genoa (Nutting, Barr).—Bulb large; solid; outer skin deep red-purple, inner red-purple; flesh white, tinged at margins. Crop, 30 lb.; 47 lb., fairly even. No. 84 had several white and No. 85 some brownish.

79, 80, 81. Red Italian Tripoli (Nutting, Carter, Harrison), **A.M.** October 10, 1893; No. 79, **XXX** July 27, 1917.—Bulb large; solid; outer skin red-purple, inner reddish purple, white base; flesh white, tinged at margins. Crop, 61½ lb., 31 lb.; even. Nos. 80 and 81 mixed red and white, and not keeping.

(b) Bulbs oval.

86, 87. Southport Red Globe (Morse, Barr), **F.C.C.** November 13, 1888.—Bulb small; rather loose; outer skin deep red-purple, inner red-purple; flesh white. Crop, 16 lb., 17 lb.; uneven, poor.

78. Red Wethersfield (Morse).—Bulb medium, variable; some solid, some loose; outer skin dark purple-red, inner reddish purple; flesh white, tinged at margins. Crop, 17½ lb.; uneven. Some flat.

SPRING-SOWN ONIONS AT WISLEY, 1917.

FORTY-THREE stocks of Onions were sent in for trial in the spring of 1917. The seeds were sown on land which had been occupied by peas in 1916. After the peas were cleared away in August, mustard was sown, and the crop dug in in October, the ground remaining rough through the winter. The seeds were sown on March 20 in rows 14 inches apart, and, with the few exceptions which are noted below, germinated well, and growth was good until about the middle of May, by which time they had been dusted with soot three times. The Onion fly, which is always a serious pest at Wisley on spring-sown Onions, then made its appearance, and its attacks were only partially prevented by the use of paraffined sand sprinkled along the rows. The crop was consequently very irregular, and the weights produced are therefore not included in the notes given below. On thinning, 6 inches was allowed from plant to plant. The Fruit and Vegetable Committee visited the trial on September 28 and recommended the following awards:

Highly Commended (**XXX**).

35. A1, sent by Messrs. Sutton (**F.C.C.** 1893 (Sutton)).
20. Ailsa Craig, sent by Messrs. Dobbie.
12. Bedfordshire Champion, sent by Messrs. Sutton.
32. Champion, sent by Messrs. E. W. King.

Commended (**XX**).

25, 26. Up-to-Date, sent by Messrs. Nutting and Mr. Gray.

In addition to the earlier award mentioned above, stocks of the following had received awards in previous trials: 'White Leviathan' (**A.M.** 1917); 'Cranston's Excelsior' (**A.M.** 1907); 'White Globe' (**F.C.C.** 1883).

VARIETIES.

1.* Silver-skinned Pickling.
2. Improved Queen.
3. White Leviathan.
4. Nuneham Park.
5., 6., 7. Cranston's Excelsior.
8. Main Crop, Veitch's.
9. Main Crop, Dobbie's.
10. White Spanish.
11. Improved White Globe.
12., 13., 14. Bedfordshire Champion.
15. The Sutton Globe.
16. Perfection.
17. Improved Reading.
18., 19., 20. Ailsa Craig.
21. Ailsa Craig, Selected.
22. Giant Lemon Rocca.
23. Golden Globe.
24. Sandy Giant.
25., 26. Up-to-Date.
27. Prize Brown Globe.
28. Trebons.
29. Danvers' Yellow.
30. James' Keeping.

* See footnote, p. 107.

31. Sandy Prize.
32. Champion.
33., 34. Giant Zittau.
35. A1.
36. Early Gem.
37. Sandy Gem.
38. Giant Rocca.
39. Blood Red Large Globe.
40. Selected Red.
41. Walker's Exhibition.
42. Long Keeping.
43. Brown Globe.

Descriptions.

I White Varieties.

Bulbs flat.

2. Improved Queen (Sutton).— Failed.

1. Silver-skinned Pickling (R. Veitch).—Bulb small; rather soft; outer skin white, inner greenish; rather uneven.

3. White Leviathan (Sutton).—Crop even. See No. 11, Autumn-sown Onions.

II. Yellow Varieties.

(*a*) *Bulbs flat.*

32. Champion (E. W. King), **XXX** September 28, 1917.—Bulb large; solid; outer skin brown straw, inner yellow green. Even.

33, 34. Giant Zittau (R. Veitch, Nutting).—Crop fairly even. See Nos. 37–39, Autumn-sown Onions.

17. Improved Reading (Sutton).—Crop even. See No. 68, Autumn-sown Onions.

4. Nuneham Park (R. Veitch).—Crop even; bulb flat-round. See No. 64, Autumn-sown Onions.

31. Sandy Prize (Gray).—Bulb of medium size; fairly solid; rather uneven; outer skin brown straw, inner greenish yellow.

41. Walker's Exhibition (Nutting).—Bulb large; solid; outer skin straw-yellow, inner greenish yellow; fairly even.

10. White Spanish (R. Veitch).—Crop poor. See No. 8, Autumn-sown Onions.

(*b*) *Bulbs oval.*

35. A1 (Sutton), **XXX** September 28, 1917.—Crop even. See No. 65, Autumn-sown Onions.

18, 19, 20, 21. Ailsa Craig (R. Veitch, Simpson, Dobbie, Sutton), No. 20, **XXX** September 28, 1917.—Stocks Nos. 18 and 19 were uneven. See 45, 46 &c., Autumn-sown Onions.

12, 13, 14. Bedfordshire Champion (Sutton, Simpson, R. Veitch), No. 12, **XXX** September 28, 1917.—Nos. 13 and 14 were not as good stocks and darker in colour. See Nos. 62 and 63, Autumn-sown Onions.

5, 6, 7. Cranston's Excelsior (R. Veitch, Dobbie, Nutting).—Crop fairly even. See Nos. 28–31 Autumn-sown Onions.

29. Danvers' Yellow (R. Veitch).—Crop fairly even. Some flat-round. See No. 34, Autumn-sown Onions.

22. Giant Lemon Rocca (Sutton).—Crop rather uneven. See Nos. 20 and 21, Autumn-sown Onions.

23. Golden Globe (Dobbie).—Bulb of medium size; fairly solid; outer skin brown straw, inner greenish. Crop fairly even.

11. Improved White Globe (Sutton).—Bulb of medium size; fairly solid; outer skin golden brown, inner greenish yellow. Crop even. Almost coconut-shaped.

8. Main Crop (R. Veitch).—Bulb of medium size; fairly solid; outer skin rather deep straw, inner greenish yellow. Crop, rather uneven. Some flattish.

9. Main Crop (Dobbie).—Bulb medium to large; solid; flattish oval; outer skin golden straw, inner greenish yellow. Crop fairly even.

16. Perfection (Sutton).—Crop even. See No. 41, Autumn-sown Onions; but the latter were darker in colour.

27. Prize Brown Globe (E. W. King).—Bulb of medium size; rather loose; outer skin brown straw, inner greenish yellow. Crop fairly even.

24. Sandy Giant (Gray).—Bulb of medium size, fairly solid; outer skin brown straw, inner greenish yellow. Stock mixed and thick-necked.

15. The Sutton Globe (Sutton).—Crop even. See No. 25, Autumn-sown Onions.

28. Trebons (R. Veitch).—Crop even. See Nos. 32 and 33, Autumn-sown Onions.

25, 26. Up-to-Date (Nutting, Gray), No. 26, **XX** September 28, 1917.—Crop even. See No. 24, Autumn-sown Onions.

III. Brown Varieties.

(*a*) *Bulbs flat.*

37. Sandy Gem (Gray).—Bulb medium; fairly solid; outer skin brown, inner yellowish green. Crop, fairly even. Rather thick-necked.

(*b*) *Bulbs oval.*

43. Brown Globe (R. Veitch).—Crop fairly even. See No. 72, Autumn-sown Onions.

36. Early Gem (Sutton).—Bulb of medium size, rather loose; outer skin brown, inner yellowish green. Crop rather uneven.

30. James' Keeping (R. Veitch).—Crop fairly even. See No. 76, Autumn-sown Onions.

42. Long-Keeping (Sutton).—Crop rather uneven. See No. 75, Autumn-sown Onions.

IV.—Red Varieties.

(*a*) *Bulbs flat.*

40. Selected Red (Dobbie).—Bulb medium; fairly solid; outer skin, shining purplish red, inner red-purple, whitish base; flesh white, streaked towards margin. Crop fairly even.

(*b*) *Bulbs oval.*

39. Blood Red Large Globe (Nutting).—Bulb medium; rather loose; outer skin shining purplish red, inner red-purple, whitish base; flesh white, slightly streaked at apex. Crop uneven.

38. Giant Red Rocca (Sutton).—Bulb medium; fairly solid; some coconut; outer skin shining purplish red, inner shining pale red-purple; flesh white, streaked towards margin. Crop fairly even. Three brown rogues.

BROAD BEANS AT WISLEY, 1917.

FORTY-NINE stocks of Broad Beans were included in the trials in 1917, among them being some which had gained awards in earlier trials, and which were added for comparison with the newer comers. The ground in which they were grown was double-dug and well manured in the previous autumn, and the seed was sown on March 16 in double rows 9 inches apart and zigzagged, the seeds being 12 inches apart. Three feet separated one double row from the next. Germination and growth were good in all varieties, but a check was imposed by a severe attack of the bean weevil (*Sitones lineatus*), but after this had been overcome growth again developed well. Only one plant was attacked by the black fly, and the prompt removal of this prevented its spread. The set of pods was not good, only the early flowers producing pods as a rule; these, however, developed well in every case.

The Vegetable Committee inspected the Trial on July 6 and recommended the following awards:

Award of Merit.

5. Broad Windsor (Dobbie).
26. Exhibition Longpod (Dobbie).
43. Green Giant (Sutton).

Highly Commended (**XXX**).

22. Erdington Gem (Holder & Tilt).
1. Giant Windsor (Sutton).
41. Green Leviathan (Carter).
10. Green Windsor (Sutton).
2. Mammoth Windsor (Carter).
25. Prizetaker Exhibition Longpod (Bunyard).
33. Prolific Longpod (Sutton).

Commended (**XX**).

39. Invicta (Nutting).
8. Market Garden Windsor (Carter).

Besides those indicated above as having received awards in earlier trials, the following which had previously received awards were represented:

17. Champion Longpod, **A.M.** July 1, 1897 (Dobbie).
28. Exhibition Longpod, **A.M.** July 1, 1897 (R. Veitch).
40. John Harrison, **A.M.** July 24, 1883 (Laxton).
34, 35. Leviathan, **A.M.** June 30, 1908 (Carter).
18. Mammoth Longpod, **F.C.C.** July 10, 1894 (Carter).
14, 15. Seville Longpod, **F.C.C.** July 10, 1874 (Vilmorin).

There was little difference in the time at which the different varieties of beans were fit to pick, but the following were ready on June 25: Nos. 1, 6, 7, 8, 14, 15, 16, 17, 19, 21, 23, 29, 31, 32, 35, 42, the remainder maturing within about four days.

The varieties are grouped under 'Broad Windsor' types, with broad, almost round seeds and short pods, usually broadest towards the end, containing few seeds; 'Longpod' types with longer pods, typically containing a greater number of usually smaller seeds; and 'Fan' types with several smaller, more or less clustered pods in place of the one or two of the other types and smaller seeds. Each of these is again divided into white- and green-seeded types.

VARIETIES.

1.* Giant Windsor.
2. Mammoth Windsor.
3. Windsor Giant Four-seeded.
4. Taylor's Large Windsor.
5. Broad Windsor.
6. } Colossal Windsor.
7. }
8. } Market Garden Windsor.
9. }
10. Green Windsor.
11. Improved Long Green Windsor.
12. } Aquadulce.
13. }
14. } Seville Longpod.
15. }
16. Early Longpod Selected.
17. Champion Longpod.
18. Mammoth Longpod.
19. Mackie's Monarch.
20. Monarch.
21. Eclipse Longpod.
22. Erdington Gem.
23. } Exhibition Longpod, Bunyard's.
24. }
25. Prizetaker Exhibition Longpod, Bunyard's.
26. } Exhibition Longpod { Dobbie's.
27. } Exhibition Longpod { Sutton's.
28. } Exhibition Longpod { Veitch's.
29. The Cropper.
30. Invicta.
31. Prizetaker, White.
32. Prizetaker, Kelway's.
33. Prolific Longpod.
34. } Leviathan.
35. }
36. Monstrous Longpod.
37. Sword or Turkey.
38. Hangdown.
39. Invicta.
40. John Harrison.
41. Green Leviathan.
42. Long Green Exhibition.
43. Green Giant.
44. Green Longpod.
45. Mammoth New Green Longpod.
46. Olympic Green Longpod.
47. Dwarf White Fan or Royal Cluster.
48. Early Mazagan.
49. Beck's Green Gem.

I. BROAD WINDSOR.

(a) *White Seeded.*

5. Broad Windsor (Dobbie), **A.M.** July 6, 1917.—Height 3 feet 6 inches; haulm strong, of medium green; pods of medium green, mottled brown, 6 to 8 inches in length, broad, curved, 4 to 7 in group; seeds large, broad, 4 to 6 in pod. Ready June 27. Crop heavy.

6, 7. Colossal Windsor (Barr, Carter).—Height 2 feet 9 inches to 3 feet; haulm strong, some branching, of medium green; pods light green, mottled brown, 5 to 6 inches in length, broad, curved, 4 to 6 in group; seeds large, broad, 3 to 4 in pod. Ready June 25. Crop fairly heavy. Raised by Messrs. J. Carter between 'Aquadulce' and 'Old Harlington Windsor' (1903).

1. Giant Windsor (Sutton), **XXX** July 6, 1917.—Height 3 feet 3

* See footnote, p. 107.

inches ; haulm strong, some branching, light green ; pods light green, mottled brown, 5 to 7 inches in length, broad, curved, 4 to 6 in group ; seeds large, broad, 3 to 4 in pod. Pods less well-filled than No. 5. Ready June 25. Crop heavy. A selection from 'Windsor.'

2. Mammoth Windsor (Carter), **XXX** July 6, 1917.—Height 3 feet 3 inches; haulm of medium strength with few branches, of medium green; pods light green, mottled brown, 6 to 8 inches in length, broad, fairly straight, 4 to 6 in group; seeds large, broad, 3 to 4 in pod. Ready June 27. Crop heavy. Raised by Messrs. J. Carter between 'Seville Longpod' and 'Harlington Windsor' (1897).

8, 9. Market Garden Windsor (Carter, Barr), No. 8, **XX** July 6, 1917.—Height 2 feet 6 inches to 3 feet ; haulm strong, some branching, of medium green ; pods of medium green, mottled brown, 4 to 6 inches in length, broad, curved, 5 to 8 in group; seeds large, broad, with white eye, 5 to 8 in pod. Ready June 29. Crop heavy. A white-seeded selection from 'Dutch Longpod' (Messrs. Carter, 1899).

4. Taylor's Large Windsor (Barr).—Height 3 feet; haulm fairly strong, a few branching, light green ; pods light green, mottled brown, 4 to 5 inches in length, broad, curved, 6 to 9 in group ; seeds large, broad, 3 to 4 in pod. Ready June 28. Crop heavy.

3. Giant Four-seeded Windsor (Barr).—Height 3 feet; haulm of medium strength, a few branching, of medium green ; pods light green, mottled brown, 5 to 7 inches in length, shape various, 4 to 6 in group ; seeds, some broad, some narrow, 3 to 6 in pod. Irregular in foliage and pod; not quite true. Ready June 27. Crop medium.

(*b*) *Green Seeded.*

10. Green Windsor (Sutton), **XXX** July 6, 1917.—Height 3 feet; haulm strong, some branching, medium to dark green; pods medium green, mottled brown, 5 to 5½ inches in length, broad, curved, 5 to 8 in group; seeds large, broad, 3 to 4 in pod. Ready June 27. Crop heavy. A selection from 'Green Windsor.'

11. Improved Long Green Windsor (Barr).—Height 3 feet 3 inches; haulm strong, some branching, of medium green ; pods of medium green, mottled brown, 4 to 5 inches in length, broad, curved, 5 to 8 in group, seeds large, broad, 3 to 4 in pod. Ready June 29. Crop fairly heavy. A selection from 'Green Harlington.'

II. Longpod Types.

(*a*) *White Seeded.*

12, 13. Aquadulce (R. Veitch, Barr).—Height 1 foot 9 inches to 2 feet; haulm weak, some branching, of medium green; pods of medium green, mottled brown, 5 to 8 inches in length, medium width, mostly straight, 3 to 6 in group ; seeds large, long, 3 to 6 in pod. Pods variable, some broad. Ready June 27. Crop medium.

17. Champion Longpod (Dobbie).—Height 2 feet 6 inches; haulm

fairly strong, some branching, of medium green; pod of medium green, mottled brown, 5 to 7 inches in length, of medium width, mostly straight, 5 to 7 in group; seeds large, long, 4 in pod. Ready June 25. Crop medium.

16. Early Longpod, Selected (Barr).—Height 2 feet 9 inches; haulm fairly strong, a few branching, of medium green; pod of medium green, slightly mottled brown, 5 to 7 inches in length, both straight and curved, 4 to 7 in group; seeds variable in size and shape, 2 to 5 in pod. Not true. Ready June 25. Crop medium.

21. Eclipse Longpod (Sydenham).—Height 2 feet 9 inches; haulm strong, a few branching, of medium green; pods of medium green, mottled brown, 6 to 8½ inches in length, straight and slightly curved, of medium width, 4 to 6 in group; seeds large, long, 4 to 6 in pod. Ready June 25. Crop heavy.

22. Erdington Gem (Holder & Tilt), **XXX** July 6, 1917.—Height 3 feet; haulm strong, a few branching, of medium green; pod rather deep green, 6 to 10 inches in length, slightly curved, of medium width, 4 to 7 in group; seeds fairly large, long, 5 to 7 in pod. Ready June 27. Crop heavy. Raised by senders by crossing 'Bunyard's Exhibition' with 'Harlington.'

23, 24. Exhibition Longpod, Bunyard's (Simpson, Barr).—Height 3 feet; haulm strong, some branching, of medium green; pods of medium green, mottled brown, 6 to 7 inches in length, of medium width, straight and slightly curved, 5 to 7 in group; seeds of medium size, long, 4 to 6 in pod. Ready July 26. Crop fairly heavy.

26. Exhibition Longpod, Dobbie's (Dobbie), **A.M.** July 6, 1917.—Height 3 feet 3 inches; haulm strong, some branching, of medium to darker green; pod rather dark green, some mottled brown, 8 to 10 inches in length, slightly curved, of medium width, 4 to 5 in group; seeds large, wide, 5 to 6 in pod. Ready June 27. Crop heavy.

27. Exhibition Longpod, Sutton's (Sutton).—Height 3 feet 3 inches; haulm strong, a few branching, of medium green; pod rather dark green, some mottled brown, 7 to 9 inches in length, curved, of medium width, 4 to 6 in group; seeds long, of medium width, variable, 5 to 7 in pod. Ready June 27. Crop fairly heavy.

28. Exhibition Longpod, Veitch's (R. Veitch).—Height 3 feet; haulm of medium strength, a few branched, of medium green; pod dark green, some mottled brown, 5 to 7 inches in length, slightly curved, of medium width, 5 to 7 in group; seeds long, of medium width, 4 to 5 in pod. Ready June 29. Crop medium.

38. Hangdown (Barr).—Height 3 feet; haulm of medium strength, some branched, of medium green; pod dark green, some mottled brown, 5 to 7 inches in length, straight and curved, 4 to 8 in group; seeds long, of medium width, 4 to 6 in pod. Ready June 29. Crop fairly heavy.

30, 39. Invicta (Barr, Nutting), No. 39, **XX** July 6, 1917.—Height 2 feet 9 inches; haulm of medium strength, a few branched, light and medium green; pod dark green, some mottled, 6 to 9 inches in

length, curved, 4 to 7 in group; seeds long, of medium width, 4 to 7 in pod. Ready June 28. Crop fairly heavy. No. 30 had some broad pods.

40. John Harrison (Harrison).—Height 2 feet 9 inches; haulm fairly strong, some branched, of medium green; pod dark green, mottled brown, 5 to 7½ inches in length, variable, straight and curved, 4 to 7 in group; seeds long, of small and medium size, 4 to 7 in pod. Ready June 27. Crop medium. Variable, some narrow pods. Raised by Messrs. Harrison.

34, 35. Leviathan (Carter, Barr).—Height 2 feet to 2 feet 10 inches; haulm fairly strong, some branching, of medium green; pod medium to dark green, some mottled brown, 4 to 9 inches in length, slightly curved, of medium width, 4 to 6 in group; seeds large, long, 4 to 8 in pod. Ready June 26. Crop heavy. No. 35 was much the poorer stock. Raised by Howe of Darlington between 'Aquadulce' and 'Bunyard's Exhibition,' introduced by Messrs. Carter.

19. Mackie's Monarch (Barr).—Height 2 feet 9 inches; haulm strong, some branching, of medium green; pod of medium green, mottled brown, 6 to 8 inches in length, straight, of medium width, 4 to 6 in group; seeds long, of medium width, 5 to 6 in pod. Ready June 25. Crop heavy.

18. Mammoth Longpod (Sutton).—Height 2 feet 3 inches; haulm rather weak, some branched, of medium green; pod of medium green, mottled brown, 5 to 6 inches in length, mostly straight, of medium width, 4 to 6 in group; seeds large and long, 5 to 6 in pod. Ready June 27. Crop fairly heavy. A selection from Seville type.

20. Monarch (Barr).—Height 2 feet 9 inches; haulm strong, some branching, of medium green; pod of medium green, mottled brown, 5 to 7 inches in length, straight or slightly curved, of medium width, 5 to 7 in group; seeds long, of medium width, 4 to 5 in pod. Ready June 29. Very like No. 19, but pods more erect.

36. Monstrous Longpod (Barr).—Height 2 feet 9 inches; haulm strong, of medium green; pod dark green, mottled brown, 6 to 8 inches in length, curved, of medium width, 4 to 6 in group; seeds large and long, 4 to 6 in pod. Ready June 27. Crop heavy.

32. Prizetaker, Kelway's (Barr). — Height 1 foot 9 inches; haulm rather weak, some branching, light green; pod of medium green, some mottled brown, 5 to 7 inches in length, straight, some slightly curved, 4 to 6 in group; seeds long, of medium width, 4 to 5 in pod. Ready June 25. Crop fairly heavy. Pods rather soft.

25. Prizetaker Exhibition Longpod (Bunyard), **XXX** July 6, 1917.—Height 3 feet; haulm strong, some branching, of medium green; pod of medium green, mottled brown, 7 to 9 inches in length, curved, of medium width, 5 to 7 in group; seeds large, long, 5 to 6 in pod. Ready June 27. Crop fairly heavy.

31. Prizetaker White (Barr).—Height 3 feet to 3 feet 6 inches; haulm fairly strong, some branched, light green; pod dark green,

mottled brown, 7 to 9 inches in length, curved, 4 to 6 in group; seeds long, of medium width, 5 to 7 in pod. Ready June 25. Crop fairly heavy.

33. Prolific Longpod (Sutton), **XXX** July 6, 1917.—Height 3 feet; haulm strong, a few branched, of medium green; pod of medium green, some mottled brown, 6 to 8 inches in length, curved, of medium width, 3 to 6 in group; seeds large and fairly wide, 4 to 6 in pod. Ready June 27. Crop heavy.

14, 15. Seville Longpod (Barr, R. Veitch).—Height 1 foot 9 inches; haulm weak, some branching, of medium green; pods of medium green, slightly mottled brown, 5 to 7 inches in length, straight and curved, 4 to 7 in group; seeds large, long, 3 to 5 in pod. Ready June 25. Crop medium, No. 15 rather poor.

37. Sword or Turkey (Barr).—Height 2 feet 9 inches; haulm fairly strong, a few branched, of medium green; pods dark green, some mottled brown, 5 to 9 inches in length, straight, some slightly curved, 4 to 7 in group; seeds long, of medium width, 4 to 5 in pod. Ready June 29. Crop medium.

29. The Cropper (Bell).—Height 2 feet 9 inches; haulm of medium strength, branched, light green; pods of medium green, some mottled brown, 6 to 8 inches in length, curved, 4 to 6 in group; seeds long, of medium width, 4 to 6 in pod. Ready June 25. Crop medium. Raised between 'Aquadulce' and 'Bunyard's Exhibition' by Mr. David Bell.

(*b*) *Green Seeded.*

43. Green Giant (Sutton), **A.M.** July 6, 1917.—Height 3 feet 3 inches; haulm strong, a few branched, of medium green; pods dark green, some slightly mottled brown, 7 to 9 inches in length, fairly straight, of medium width, 5 to 8 in group; seeds long, of medium width, 5 to 7 in pod. Ready June 27. Crop heavy. A selection from 'Green Longpod.'

44. Green Longpod (Sutton).—Height 2 feet 9 inches; haulm strong, of medium green; pod dark green, some mottled brown, 5 to 7 inches in length, curved, of medium width, 5 to 7 in group; seeds large, long, 4 to 5 in pod. Ready June 27. Crop fairly heavy.

41. Green Leviathan (Carter), **XXX** July 6, 1917.—Height 2 feet 9 inches; haulm strong, some branching, of medium green; pod dark green, some mottled brown, 6 to 7 inches in length, curved, of medium width, 4 to 7 in group; seeds long, of medium width, 4 to 7 in pod. Ready June 29. Crop heavy. A selection from 'Leviathan.'

42. Long Green Exhibition (Barr).—Height 2 feet 6 inches; haulm variable in strength, some branched, lightish green; pod dark green, some mottled brown, 5 to 6 inches in length, straight, of medium width, 5 to 6 in group; seeds long, of medium width, 3 to 4 in pod. Ready June 25. Crop medium. A few with curved pods.

45. Mammoth New Green Longpod (Barr).—Height 3 feet; haulm

fairly strong, some branched, of medium green; pod dark green, 4 to 8 inches in length, straight and curved, of medium width, 5 to 12 in group; seeds small and medium, 2 to 4 and 6 in pod. Ready June 27. Crop medium. Not true, variable, short and long pods—not more beans in long ones. A selection from 'Green Longpod.'

46. Olympic Green Longpod (Simpson).—Height 3 feet; haulm fairly strong, some branched, of medium green; pod dark green, some mottled brown, 6 to 8 inches in length, curved, of medium width, 3 to 5 in group; seeds long, of medium width, 5 to 6 in pod. Ready June 27. Crop medium.

III. Dwarf Fan-Podded Types.

(*a*) *White Seeded.*

47. Dwarf White Fan or Royal Cluster (Barr).—Height 1 foot 6 inches to 2 feet; haulm rather weak, branched, light green; pod dark green, 3 to 4 inches in length, nearly straight, narrow, 8 to 12 in group; seeds small, roundish, 2 to 3 in pod. Ready June 27. Crop fairly heavy. Small foliage, pods in fan shape, small, upright.

48. Early Mazagan (Barr).—Height variable, 1 foot 6 inches to 3 feet 6 inches; haulm fairly strong, some branched, light green; pod of medium green, 3 to 4½ inches in length, nearly straight, 8 to 15 in group; seeds small, roundish, 2 to 3 in pod. Ready June 29. Crop medium. Small foliage, pods in fan shape, small, upright.

(*b*) *Green Seeded.*

49. Beck's Green Gem (Barr).—Height 18 inches to 2 feet; haulm rather weak, branching, light green; pod dark green, 2½ to 3 inches in length, nearly straight, narrow, 8 to 15 in group; seeds small, roundish, 2 to 3 in pod. Ready June 27. Crop fairly heavy. Small foliage, pods in fan shape, small, upright.

ESCHSCHOLZIAS AT WISLEY, 1917.

FORTY stocks of Eschscholzias were received for trial in 1917. They were sown in rows one foot apart on March 28, on ground which was not manured this season. They all germinated well and were thinned to 9 inches between the plants as soon as large enough.

The Floral Committee examined them on two occasions and selected as the best in the trial, recommending awards as indicated :—

Award of Merit.

Nos. 17, 18. crocea Mandarin (**F.C.C.** 1887).
Nos. 19, 23. Mikado (**A.M.** 1908).

Highly Commended (**XXX**).

No. 8. Golden West.
No. 11. Orange King.
Nos. 24, 25, 26. Chrome Queen.

VARIETIES.

1. *californica alba fl. pl.
2. crocea fl. pl.
3. crocea double.
4. crocea fl. pl. Improved.
5. Orange Queen.
6. californica alba.
7. californica.
8. Golden West.
9. fimbriata.
10. crocea aurantiaca.
11. 12. 13. Orange King.
14. 15. The Geisha.
16. Mandarin.
17. crocea compacta Mandarin.
18. Mandarin Improved.
19. 20. 21. Mikado.
22. californica caniculata Mikado.
23. Mikado Improved.
24. 25. 26. Chrome Queen.
27. 28. Diana.
29. Rosy Dawn (syn. intus roseus).
30. compacta intus roseus.
31. crispa (syn. Rosy Morn).
32. Rose Cardinal.
33. 34. Fireflame.
35. The Rajah.
36. Carter's Rajah.
37. Thorburni.
38. Carter's Hybrids.
39. Mikado canaliculata.
40. Carmine King.

(*a*) *Creamy White.*

6. californica alba (Barr).—Height 18 inches; flowers $1\frac{1}{2}$ to 3 inches, single; petals entire or slightly notched. Needs further selection.

1. californica alba fl. pl. (Barr).—Height 9 to 12 inches; habit fairly compact; flowers $1\frac{1}{2}$ to 2 inches; single and semi-double.

* See footnote, p. 107.

(b) Chrome, deeper at base, lighter outside.

24, 25, 26. Chrome Queen (R. Veitch, Barr, Watkins & Simpson), **XXX** July 5, 1917.—Height 16 to 18 inches; flowers 2 to 2¾ inches; single.

(c) Chrome with Orange Base.

7. californica (Barr).—Height 18 to 20 inches; flowers 2 to 3 inches; single; mixed with orange.

9. fimbriata (Barr).—Height 16 to 18 inches; foliage reddish; flowers 1½ to 2 inches; single or semi-double; petals fimbriated in some plants, in others normal; mixed, orange, orange and brown, &c.

8. Golden West (Barr), **XXX** July 5, 1917.—Height 18 to 20 inches; foliage reddish; flowers 2 to 3 inches; single.

(d) Orange.

10. crocea aurantiaca (Barr).—Height 20 to 22 inches; very free-flowering; flowers 2 to 3 inches; single; mixed with chrome, orange base.

2, 3, 4, 5, crocea fl. pl. (Barr, R. Veitch, Watkins & Simpson, Barr), **F.C.C.** July 3, 1877.—Height 16 to 18 inches; flowers 1½ to 2½ inches; single and semi-double. No. 5 was sent in as Orange Queen.

11, 12, 13. Orange King (Watkins & Simpson, R. Veitch, Barr), No. 11, **XXX** July 20, 1917.—Height 16 to 18 inches; very free-flowering; flowers 2 to 3 inches; single. Nos. 12 and 13 not so good as stock 11.

(e) Crimson-brown outside, orange, streaked crimson-brown inside.

16, 17, 18. crocea compacta Mandarin (Barr, Sydenham, Barr), **F.C.C.** July 3, 1887; Nos. 17 and 18, **A.M.** July 20, 1917.—Height 18 to 20 inches; flowers 1½ to 3 inches; single; petals crenate. No. 16 was sent under this name, but was very mixed in colour and wrongly named.

14, 15. The Geisha (Barr, Carter), **A.M.** August 13, 1915.—Height 12 to 14 inches; flowers 2 to 2½ inches; single; petals fluted, some toothed.

(f) Crimson-brown with orange base.

19, 20, 21, 22, 23, 39. californica canaliculata Mikado (Carter, Barr, R. Veitch, Hurst, Barr, Gardiner), **A.M.** June 23, 1908; Nos. 19 and 23, **A.M.** July 20, 1917.—Height 12 to 18 inches; flowers 2 to 3 inches; single; some petals fluted; flowering June 14. Nos. 20, 21, 22, 39 mixed in colour. No. 23 was sent in as Mikado Improved.

(g) Rosy-pink outside, chrome-white inside.

27, 28. Diana (Barr, Carter).—Height 21 to 23 inches; flowers 2½ to 3½ inches; single; petals fluted. No. 27 mixed for fluting.

(h) Rosy carmine.

29. compacta Rosy Dawn (Barr).—Height 18 to 20 inches; flowers 2½ to 3 inches; single.

30. compacta intus roseus (Sydenham).—Like 29, but not quite true to colour.

(i) Rosy-purple outside, whitish inside.

31. crispa (syn. Rosy Morn) (Barr).—Height 16 to 18 inches; flowers 2 to 2¾ inches; single; petals fluted. Mixed lemon and orange. Very like No. 32.

(j) Rosy-purple outside, blush inside.

32. Rose Cardinal (Barr).—Height 16 to 18 inches; flowers 2 to 2¾ inches; single; petals fluted. Very like No. 31.

(k) Purple-carmine, ivory base.

35, 36. The Rajah (Barr, Carter).—Height 17 inches; flowers 2 inches; single; edges of inner petals slightly incurved.

40. Carmine King (Gardiner).—Height 16 inches; flowers 2 to 2½ inches; single; petals slightly fluted. One orange rogue and one very pale mauve.

(l) Crimson-brown outside, orange suffused crimson-brown inside.

33, 34. Fireflame (Barr).—Height 12 to 18 inches; flowers 2 to 3 inches; single; petals slightly fluted. No. 33 had one plant dwarf (9 inches); flowers 1¾ to 2 inches; bell-shaped; dull rosy-carmine outside, streaked yellowish-white inside.

37. Thorburni (R. Veitch).—Height 15 inches; flowers 2½ to 3 inches; single; petals slightly fluted; similar to 'Fireflame' but foliage generally smaller.

(m) Mixed colours.

38. Hybrids (Carter).—Height 18 inches; flowers 2 to 2½ inches; single; mixed, crimson-orange, rosy carmine, and brownish-carmine.

NATIONAL DIPLOMA IN HORTICULTURE.

THE third Final and the fourth Preliminary Examinations for Professional Gardeners for the National Diploma in Horticulture took place in June 1917. The number of candidates was small owing to the war, five only offering themselves for the Final Examination, viz. three in Section I. (General Horticulture), of whom two passed, and one each in Section V. (Landscape Gardening) and Section VII. (Horticultural Inspection), who both attained the pass standard. Fifteen candidates sat for the Preliminary Examination, but the standard reached by the majority was not a high one, and only four passed.

It cannot be too widely recognized that the standard set at these examinations is a high one and the tests searching. Only those who have had a fairly wide experience and have thoroughly prepared themselves have a chance of success.

The list of successful candidates is given below.

LISTS OF SUCCESSFUL CANDIDATES.

FINAL EXAMINATION.

Section I.

Thrupp, H. M. B.
Heron, M.

Section V.

Woolley, R. V. G.

Section VII.

McIvor, D. G.

F. J. CHITTENDEN, F.L.S.
W. CRUMP, V.M.H.
A. G. L. ROGERS.
T. STEVENSON.
EDWARD WHITE.
} *Examiners.*

PRELIMINARY EXAMINATION.

Herring, L. K.
Joshua, L. H.
Oldham, C. H.
Thornton, E. R.

F. J. CHITTENDEN, F.L.S.
W. CRUMP, V.M.H.
T. STEVENSON.
} *Examiners.*

EXAMINATION OF SCHOOL TEACHERS IN COTTAGE AND ALLOTMENT GARDENING.

April 18, 1917.

Six hundred and fifteen candidates entered for the Examination held on April 18, 1917. Of these, 27 obtained a first class, 296 a second, and 232 a third, leaving 36 failures (including one who only answered one question in Section B and who would otherwise have appeared in the list) and 24 absentees.

The Examiners (Mr. F. J. Chittenden, F.L.S., Mr. John Fraser, F.L.S., Mr. W. Crump, V.M.H., and Mr. C. R. Fielder, V.M.H.) report that many candidates advocated burning the turf, forgetting that this would destroy most of its manurial value. The proportions of ground to be devoted to various crops were generally well set forth; but there was much lack of knowledge of the quantities of the different seeds required for cropping it. There was better knowledge of Rotation and Intercropping than of Successional Cropping.

The knowledge of insects was, for the most part, clearly that obtained from books, and, as a result, there was but little known as to the best methods of destroying them. There was the usual confusion as to annuals, which were made to include bulbous plants and perennials. There were some excellent answers on how to break up pasture land for potatos, and also on hardy fruits and methods of storing them.

Only a few of the answers in Section B were really well done. The question on "sticky" soils was mostly avoided, although a proper understanding of their character lies at the root of gardening on all clay soils. The question relating to lime was better handled, but a few candidates still fail to distinguish between the various forms of lime, and persist in regarding superphosphate of lime as of value in the soil in the same way as quick or slaked lime, or carbonate of lime.

The Examiners cannot but regret the failure of almost all candidates to base their methods on ascertained facts of plant and animal life, and also the tendency to substitute rule of thumb and memorized text-book statements for reasoned answers to the questions asked. This is nowhere more apparent than in the answers concerning plant pests.

Notwithstanding the notice at the top of each sheet of the foolscap paper block, many candidates omitted to commence each question on a fresh sheet. This causes much extra trouble and delay in despatching the answers to the different examiners. Also, candidates should answer each question fully and independently of any other

answer, and not refer the examiner to an answer given to another question, which may be miles away in the hands of another examiner for marking.

W. WILKS, *Secretary R.H.S.*

Class I.

1. Fidler, A. S., 3 Cresselly Villas, Mountain Ash.
2. Bull, A. R., School House, Culmstock.
   Dix, H., Loscoe Road Council School, Heanor.
4. New, F. W., The Cabin, Park Road, Cheam.
5. Harries, J. D., 99 Court Road, Cadoxton.
6. Watson, B. J., The Cottage, Eastnor.
   Wyatt, F. C., 2 Oxford Street, Burnham.
8. Watkins, T. J., Cefn Forest School, Pengam.
9. Killick, E. W. J., Aldringham.
10. Loyn, G. M., Colfadail, Llanrhystyd.
    Thomas, W., Post Office, Tairgwaith.
12. Adams, C. G., The School, Collingbourne Ducis.
13. Griffiths, E. O., Glanbrenig, Tregaron.
    Moakes, Miss L., Clay Bank Farm, Earlswood.
15. Battison, G., 8 Holyoake Terrace, Long Buckby.
16. Eden, Miss M., 3 Catherine Street, Crewe.
    Willcox, Miss A. P., 18 Elmdale Road, Clifton.
18. Goodison, E., " Knighton," Whiteley Wood Road, Eccleshall.
    Heal, Miss L., School House, How Caple.
    Leavesley, H., School House, Monkton Farleigh.
    Summers, A. D., " Hazeldene," Drayton.
    Westcott, J. R., School House, Bridestowe.
    Wetherall, J. A., " Sunnyside," Ashbourne.
24. Davis, Miss M. L., 36 Strathyre Avenue, Norbury.
    Pearson, H., School House, Lea.
    Sanders, A., 140 Ivanhoe Street, Scott's Green.
    Wybrow, W., School House, Swyncombe.

Class II.

1. Fuller, Miss K. E., 1 Harbord Street, Fulham.
   Hocking, T. O., Munslow School, Craven Arms.
3. Ashby, C. A., Lyndhurst, Broseley.
   Boyer, M., 19 Welsh Row, Nantwich.
   Little, W. B., 1 Halse Road, Brackley.
   Sutcliffe, M., 231 Willow Mount, Sowerby Bridge.
7. Cawley, J. H., 47 John Street, Longbridge Hayes.
   Chadwick, A. J., Copstow Villas, Tean.
   Daniell, Miss F., Bilston Green, Cinderford.
   Evans, J., School House, Cilgerran.
   Faulkner, G., School House, Knowle.
   Kent, Miss E., 12 Winstanley Road, Sheerness.

13. Ball, Mrs. F., St. James School, Halesworth.
Edgell, H. C., Council School, Radstock.

15. Brooks, R. B., School House, Keelby.
Coombe, R. H., Bishop Wordsworth's School, Salisbury.
Gilby, H. J. (Sgt.), 3rd London General Hospital, Wandsworth.
Henn, Miss D. E., Pitchford, Condover.
Moore, Mrs. E. A., School House, Long Melford.

20. Dewhirst, Miss A. E., 21 Marlborough Road, Shipley.
Marmion, J., 13 Alexandra Road, Birkenhead.
Vial, A. E. L., 5 Dulverton Road, Leicester.
Walpole, G. W., "Talgarth," Llanvaches.
Wilkinson, S. T., "Enfield," South Avenue, Coventry.
Woodward, G. H., 32 Emily Street, West Bromwich.

26. Bates, F. O., 126 Sandwell Street, Walsall.
Benbow, G. F., 114 New River Crescent, Palmers Green.
Crickard, F. J., 24 Blagdon Road, New Malden.
Fuke, J. B., Synton House, Moretonhampstead.
Hallam, H. M., 116 Radford Boulevard, Nottingham.
Jennings, A. J., 63 Walsgrave Road, Coventry.
Mack, J. H., London Street, Swaffham.
Royston, G., Silver Street, Willingham.
Townsend, Miss I. G., School House, South Ockendon.

35. Mallin, Mrs. L., School House, Broome.
Manning, Miss L., New Street School, Cambridge.
Perkins, F. H., Industrial School, Desford.
Phillips, Miss L. E., Barton Road, Bournemouth.
Potter, F., 45 Gordonbrock Road, Brockley.
Sibley, D. W., 55 School Street, Church Gresley.
Thomas, Mrs. S. E., 31 Waldegrave Road, Teddington.
Williams, Miss E. E., 303 Church Road, St. George.
Wood, E., School House, Pant Glas.

44. Ballard, Miss S. J., School House, Chearsley.
Band, D., 51 Craigie Road, Perth.
Harrison, W. W., School House, Langwith.
Kent, J., 45 Mellows Road, Wallington.
Rissen, Miss E. F., 30 Eastbury Avenue, Barking.
Taylor, H. E., 309 Burntwood Lane, Wandsworth.
Thompson, H., Ivydene Villa, Barton-on-Humber.
Westcott, W., "Garfield," Pinhoe.

52. Blacklee, A. P., North House, Mistley.
Bolton, Miss M., 72 Margaret Grove, Harborne.
Ellis, Miss E., 16 Beacon Lane, Horton Bank Top.
Nichols, L., Castlethorpe, Stony Stratford.
Shoebridge, Miss C. L., 3 Park Grove, Bromley.
White, P. G., Hilldrop Villa, Helions Bumpstead.

58. Bryning, J. W., Holm View, Watchet.
Cheetham, Miss C. A., Porth-y-gan, Wrexham.
Ellis, Miss M. G., 13 Dorville Road, Lee.

Fettes, J. M., 10 Ellen Terrace, New Washington.
Hext, Mrs. E. M., School House, Yarnscombe.
Hinchcliffe, Miss W. A., Blidworth, Mansfield.
Pascoe, Miss H. A., "Restcote," Soham.
58. Quarmby, J. A., Holly Bank, Greetland.
Skerrey, E. W., 5 Cromwell Terrace, King's Lynn.
Turton, W., 10 Market Street, Little Lever.
Wheeler, F. H., 11 West Street, Southend.
Williams, W. R. A., Cambrian House, Newtown.
Aubrey, D., 31 Aberdeen Road, Wealdstone.
Conder, Miss W. M., 57 Church Hill, Royston
Fletcher, L., The Lydiates, Kinver.
Hall, Miss H., 2 Polam Avenue, Darlington.
Manning, Mrs. F. E., Dorstone, Hereford.
Preston, W., School House, Lewknor.
70. Ryder, Miss L. E., Tittensor.
Shambrook, C. J., 46 Colesburg Road, Beckenham.
Squire, Miss E. A., Training College, Norwich.
Suckling, Miss L. M., 57 Eagle Road, Wembley.
Warren, C. D., 63 Comer Gardens, Worcester.
Weaver, Miss M., 12 Reedville, Claughton.
Carey, J. O., Stradbally Boys' School, Queen's County, Ireland.
Cox, F. L., Gordon Place, Littleport.
Crofts, Miss I., 20 Avenue Road, Southend.
Evans, L. N., 4 Maengwyn Villas, Machynlleth.
Goode, E. A., Princes Road, Cheltenham.
82. Houghton, E. H., 26 Sopers Grove, Basingstoke.
James, J., Gwynfe Council School, Llangadock.
Jarman, D. T., Derlwyn, Ynysybwl.
Ryan, Mrs. M. A., Fair View, St. John's, Isle of Man.
Straw, W., 102 Market Place, Worksop.
Clay, F. A., 7 Ellesmere Avenue, Lincoln.
Davey, F. W., School House, Burnham Market.
92. Foster, S. J., Colley Elm, Southey.
Gaddard, Miss E. E., School House, Westbury.
Kirk, Miss A., 14 Weardale Street, Wheatley Hill.
Rhodes, Miss C., 19 Rochester Terrace, Headingley.
Alexander, T. C., Upper Leyton, Tintern.
Blencowe, J. C., 21 Church Street, Pembroke Dock.
Burke, Miss M. M., 18 Wynyard Grove, Gilesgate.
Coster, Miss E. L., Moor Lane, Rickmansworth.
Cumberland, A., 82 Belvedere Road, Burton.
98. Earle, B. V., Watchet, Somerset.
Hande, W. J., Boys' School, Ballinakill, Ireland.
Jenkins, A. J., Dunraven House, Penclawdd.
Johnson, Mrs. M., School House, Bowers Gifford.
Lowery, J. H., "St. Hilda," Hednesford.
Marsh, Miss E. M., Highfield Villa, Thatto Heath.

98. Mead, A., Ferry View, Bourne End.
Walton, Miss J. A., 3 Midland Terrace, Pleasley.
Watkins, F. J. H., Kingswood, Melksham.
Wilmot, Miss I. V. M., 3 Beecroft Road, Brockley.
Wyldes, Miss K., 45 Mellows Road, Wallington.

114. Armstrong, Miss N. S., Mangerton, Lea Cross.
Collins, H. H., 89 Wellsway, Bath.
Cooke, Mrs. A., Ogbourne St. Andrew School, Wilts.
Davies, T., "Clifton," Gwaun-Cae-Gurwen.
Dean, Miss W. A., 20 St. Albans Road, Harlesden.
Laurie, Miss H. N., 35 Pinkie Road, Musselburgh.
Radford, G. L., "Gattons," Westcliff-on-Sea.
Smith, Miss A., "Elmlea," Winchester.
Smith, C. J., Syke Cottages, Stacksteads.
Woollett, H. W., Milton Keynes, Newport Pagnell.
Wrigley, H. B., 36 Dixon Road, Hillsbro'.

125. Angell, C. B., 6 School Street, Easington Colliery.
Atwell, C., 21 Croft Road, Wallingford.
Bennetts, W. N., Oaklea, Ramshill.
Exton, A. J., "Holmleigh," Donington.
Osborne, Miss M. L., 12 Upper Maze Hill, St. Leonards.

130. Avery, Miss E. M., 1 The Willows, Herstmonceux.
Bell, W. A., School House, Hewish.
Buckley, Miss A. C., 10 Ryhall Road, Stamford.
Franklin, Miss L. A., Trelleck, Monmouth.
Hatswell, H. J., School House, Mottisfont.
Hodges, A., Woodford House School, Birchington.
Kirton, H. J., 58 Cranmer Street, Nottingham.
Leeke-Roe, Miss M. C., 13 St. Catherine's Terrace, Guildford.
Mather, J. L., Almorah, Ynysboeth.
Platts, J., Dennington, Framlingham.
Rolfe, Miss A., Grantchester School House, Cambridge.
Roper, J. E., 14 Main Street, Great Bowden.

142. Brander, S. P., 19 Oldcott Green, Stoke-on-Trent.
Henry, J. G., 52 Livesey Street, Rishton.
Lewis, A. H., North Road, Timsbury.
Marshall, Miss A. M., Friar Street School, West Southwark.
Millard, G. E., 104 London Road, King's Lynn.
Reading, W. H., 179 Haxby Road, York.
Robinson, Miss E. L., 2 Cobden Terrace, Hipperholme.
Truran, W. H., Carnkie, Redruth.
Webb, L. R., 108 Dumfries Street, Treherbert.
Wedgewood, T. W., 6 School Street, Easington Colliery.

152. Bennett, Miss E. C., School House, Little Wittenham.
Billington, A., 28 College Drive, Woodhay.
Grainger, Miss A. C., School House, Yockleton.
Lawton, H. H., 20 Walsall Road, Lichfield.
Mason, Mrs. M., 52 Brow Field, Silsden.

Shepherd, W., School House, Blidworth.
Stapleton, Miss E. M., 227 Railton Road, Herne Hill.
152. Webb, Miss H. M., The Elms, Bromham.
Weller, Miss H. O., 4A Lownds Avenue, Bromley.
Yates, Miss L. E., Foxdale, Stourbridge.

Armstrong, R., 15 Fern Avenue, South Moor, West Stanley.
Beamish, Miss E., Holmswood, Ormskirk.
Blackwell, R., Sagars Road, Handforth.
Brambley, S. J. E. S., School House, Exford.
162. Clark, Miss E. J., Holly Grove, Ascot.
Collins, H., The Mount, Wainfelin.
Crouchen, Miss P. K., 11 King's Road, Leiston.
Robinson, Miss M., Rose Cottage, Kirkland.
Sander, H. B. H., Lacy Avenue, Wilmslow.

Bengough, Miss E. M., 42 Beauchamp Road, Forest Gate.
Bullock, P., 71 Yoxall Avenue, Hartshill.
Gollick, Mrs. M., 180 Garden City, Worksop.
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171. Jones, W. A., 25 Prescott Street, Hoole.
Mildon, E. H., 26 Thingwall Park, Bristol.
Parkinson, E. M., 4 Woodlea Road, Worthing.
Pickard, Miss M., 53 Clifton Road, Rotherham.

Blight, Miss G., 17 Tyrawley Road, Fulham.
Compton, E., 5 Chapel Street, Oswestry.
Dykes, Miss E. M. I., School House, Hassop.
Foweraker, E. B., 3 Harcourt Hill, Redland.
Guy, J., Parochial School, Mountmellick.
Lane, H., 28 Holcombe Street, Derby.
179. Mead, C. D., 6 York Terrace, Devizes.
Rees, T. E., The Briars, Killay.
Renshaw, Miss L. W., Bircle Vicarage, Bury.
Rose, A. S., "Glenroy," Southampton.
Saunders, J. S. W., Daisy Villas, Staveley Town.
Taylor, H. C. G., School House, Drayton.

Barber, Miss A. M., 4 Wilmington Gardens, Barking.
Chapman, Mrs. E. K., 11 Aldeburgh Place, Woodford.
Dyer, Miss A. G., Bedingfield School, Eye.
Forfitt, Miss A. M., 34 Glenparke Road, Forest Gate.
Furness, J., Farm Training Colony, Wallingford.
Griffiths, L. W., Industrial School, Bonymaen.
Hayward, Miss F. E., Belle Vue Road, Cinderford.
191. Higham, Miss L., Hill View, Mawdesley.
Lovett, Mrs. L., 119 Wakehurst Road, Clapham.
Mortimore, P. T., 36 East Grove Road, St. Leonards, Exeter.
Page, J., Blaisdon School House, Longhope.
Roberts, D., Cantal School, Llanbister Road.
Spink, Miss A. M., Thoresway School, Caistor.
Urry, Miss M. J., White House Farm, Grasby.

Wardman, Miss E., Schoolhouse, Litlington.
191. Weymouth, P. E., 41 Tivoli Road, Margate.
Willott, Miss E. J., 13 Longdin Street, Latchford.
Bellerby, J. R., 11 Scarcroft Hill, York.
Bott, Miss B., Lanercost Hotel, Brampton.
Bothwell, E. B., 37 Selborne Road, Ilford.
Buxton, H., The Poplars, Middle Ings, Hoyland.
Crouch, Miss L. E., University College, Reading.
Davis, P. J., 4 Cranbrook Road, Redland.
Goodall, B., 47 Westleigh Lane, Leigh.
208. Huntley, R. W., The Old Rectory, Ashington.
Jennings, Miss M., Swan Bottom, Great Missenden.
Johnston, Miss E. J., 2 Newstead Road, Liverpool.
Larkin, Miss M. F., School House, Wicken.
Robson, Miss A., 26 Electric Crescent, Philadelphia.
Sparks, A. E., Kensington House, Pensford.
Tiller, Miss I. M., "Heathfield," South Farnbro'.
Birtle, Miss S. R., Moorhead Cottage, Saltaire.
Clapham, J. B., 3 Cobham Road, Norbiton.
Corke, Miss E. F. C., East Compton School, Bristol.
Fisher, H. B., Soke Road, King's Lynn.
222. Gould, Miss A. E., 67 Shrubbery Avenue, Worcester.
Hare, T., School House, Longley-on-Tyne.
Jones, D. E., Green Bank, Ferndale.
Stinson, Miss A. E., 43 Leonard Street, Hull.
Toop, T. G., 32 Lyndhurst Drive, Leyton.
Beaumont, Miss L., Daisy Hill, Shepley.
Budden, Miss L. M., 40 Arlington Road, Surbiton.
Carrick, E. W., Gordon Lane, Ramshaw.
Collis, Miss E. M., School House, Henfield.
Frisby, Miss C. A., Lonsdale House, Deeping.
Goodacre, G. W., Harrow Villa, Melton Mowbray.
Hermon, R., School House, Manley.
Holdstock, Miss E. K., Harrow Road, Worthing.
Hughes, D. M., 4 George's Road, Shiel Park.
231. Jones, J. M., Cwmgwili Council School, Cross Hands.
Jones, W. C., 13 Herbert Street, Aberdare.
Lewis, T., 40 Pleasant Street, Morriston.
Newman, Miss G., 31 Upperton Road, Eastbourne.
Page, Miss W., 48 Locket Road, Wealdstone.
Patrick, Miss E., 10 Harcourt Street, Heworth.
Rees, W. H., Council School, New Tredegar.
Rushby, H., School House, Glentham.
Shaw, Mrs. M., 31 Grove Terrace, Bradford.
Bendall, E. B., Church House, St. Arvans.
Branter, W., 184 Parkside Road, West Bowling.
249. Brown, Mrs. E., Eversley, Ballinger.
Browne, Miss M. A., School House, Abbeycwmhir.

Carter, W., 5 Bridge Street, Usk.
Dixon, T. F., Askham Richard.
Essex, T. P., 73 Bath Road, Walsall.
Goode, Miss W. A., Longley, Island Road, Westbere.
Gould, Miss M. O., 4 Fair View, Oulton Broad.
Lee, Mrs. M. E., Banks Avenue, Pontefract.
Mitchell, Miss R. V., South View, Samares.
Read, Miss C., School House, Castle Ashby.
249. Rees, D. E., School House, Pentre Broughton.
Rice, T., North View, Ilkeston.
Scales, Miss E., 63 Gordon Road, Aldershot.
Spicer, Miss L. M., Brook Road, Stourbridge.
Stevens, H. J., 355 Wellingborough Road, Northampton.
Suckling, C. E., 22 Edburton Avenue, Brighton.
Waters, Miss I., Hooke, Beaminster.
Weaver, Miss M. G., Warden Hill Farm, Leckhampton.

Baker, Miss E. W., Knollsea, Paignton.
Beach, Miss E., Ruspage Cottage, Ruspidge.
Beach, Miss B., Ruspidge, Cinderford.
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Deaville, Miss A., School House, Tissington.
Higgins, J., 20 Wilson Terrace, New Silksworth.
Jones, H. C., Clungunford School, Aston-on-Clun.
Mayne, Miss M., Quadring Fen Council School.
269. Miller, F., School House, Castleton.
Mitchell, Miss E. J., 221 Shay Lane, Holmfield.
Reed, A., 6 Vicarage Terrace, Murton.
Souter, R. C., 45 North Terrace, Wallsend.
Taylor, Miss D. E., 20 Effingham Road, Lee.
Thompson, C. S., School House, Helmingham.
Underhill, R. G., 6 Ashfield Terrace, Ryton-on-Tyne.
Wallis, Miss R., Sherwill School, Barnstaple.

Dale, T. G., Aldbury School House, Tring.
Graves, J. B., 172 Lister Avenue, Bradford.
Hanchet, Miss H. E., 44 High Street, Lavenham.
Harrison, R. C., Spence House, Nuttall.
Lawrence, G., School House, Hook.
Little, Miss H., Rose Cottage, Kirkland.
285. Melville, J. S., 3 Shafto Terrace, Stanley.
Shoesmith, L., 152 Park Lane, Little Horton.
Smith, R. J., 68 Marlborough Street, South Shields.
Taylor, Mrs. E., Oak House, Mawdesley.
Troughton, Miss E. J., 52 Romilly Road, Finsbury Park.
Wright, W. C., The Weavers, Binegar.

Class III.

1. Chapman, Miss E., Plantation House, Iwade.
Davis, J. W., 16 Edna Street, Battersea.
Evans, T. J., Lamb, Hermon.
Gorvett, S., 14 Single Quarters, Raftown.
James, Miss L. I., " The Bridges," Laughton.
Morris, A., Brigstock School, Thrapston.
Norrie, Miss C., 3 Balmoral Terrace, Tollcross.
Parry, T. P., 17 Park Avenue, Bush Hill Park.
Weaver, C. J. R., Garston House, Mells.

10. Benson, W., Lynwood, Lawton.
Combes, Miss E. M. M., School House, Graveney.
Davey, L. A., 50 Wembdon Road, Bridgwater.
Davies, D., The Hawthorne, nr. Pontypridd.
Evans, Miss E. F., Wern-y-Court, Bryngwyn.
Gatehouse, Miss A. N., Sollar's Dilwyn, Dilwyn.
Gillespie, Miss C. M., School House, Beddingham.
Imber, A. S., The Owls, Kingston Hill.
Johnson, Mrs. A. E., Dunton School House, Biggleswade.
Robinson, Miss A. E., 6 Beverley Terrace, Catchgate.
Spaul, J. R., 27 Oxford Street, Saltburn.
Thomas, B. J., " Brodawel," Tynybonan.
Tusting, Miss J., Bluntisham, Hunts.
Walsh, Miss Teresa, St. Godric's Convent, Durham.

24. Beeby, Miss N., 102 Palk Road, Wellingboro'.
Bennison, Miss A., " Haulsyke," New Shildon.
Drinkwater, C. H., School House, Pinegoes.
Hawker, H. W., School House, King's Teignton.
Howells, J., Maeslan, Tonteg.
Hubbard, Miss M. C., Syleham School, Scole.
Jones, D., Bryndeilo, Nantgaredig.
Knight, A., School House, Wickham.

32. Amos, C. T. B., " Ferndale," Nuneaton.
Baty, Miss S. J., Jennet's Hill, Bradfield.
Betts, A. E., Slough Fort, Rochester.
Bignell, Miss D. E., Eden Orphanage, Astley Bridge.
Crosby, G. W., School House, Glentworth.
Davies, W. H., The Hollies, Bunny.
Harlow, Miss E. F., 496 City Road, Edgbaston.
Heathe, Miss M. E. L., C.E. School, Bramley.
Hemsted, T. S., Front Street, Bedlington.
Hughes, Miss A., 12 Fairview Terrace, Merthyr Tydfil.
Mallows, G. A., 33 Harpenden Road, Manor Park.
Miller, Miss I. A. C., 5 St. Albans Road, Bristol.
O'Niel, E. F., School House, Knugden, Blackburn.
Padgeham, A. J., 8 Stanley Road, Wallington.

Pinnock, H. B., School House, Brockham Green.
32. Powell, J., Boys' Department, Aberbargoed.
Shuker, Miss I. L., School House, Blyborough.
Thompson, Miss A., 57 Argyle Road, Ealing.

Bayley, E. R. A., Mill End, Thaxted.
Berry, Mrs. A., Ranelagh, Chell Green.
Copsey, Miss E. A., Highbrook School House, Ardingly.
Durrant, Miss E. M., Holly Grove, Ascot.
50. Hilldrith, Miss M., Holton-le-Clay, Grimsby.
Kemp, Miss H., 3 Tower Parade, Tankerton.
Lewis, Miss E. F. M., 9 Stoke Park, Coventry.
Storr, Miss S. P., 63 Gordon Road, Aldershot.
Watt, H. H., St. Chad's Avenue, Portsmouth.
Williams, Miss M. P., Aston Villa, Malton.

Barr, R., Hunshelf Bank, Stocksbridge.
Benson, Miss J., 310 Walton Lane, Walton.
Chellew, G., 99 Chevening Road, N.W.
Cooper, Miss M. E., Lyng School, West Bromwich.
Croskell, Miss K., 5 Pimlico, Durham.
60. Houseman, W., Ash Cottage, Glossop.
Morgan, E. J., Cwmsyfiog Council School, New Tredegar.
Rosser, W., Pendre, Abergavenny.
Sheridan, Miss M. M., 14 Rylstone Road, Eastbourne.
Warren, Miss S. E., Fernside, Comer.

Allison, Miss G. E., 11 Queen Anne Avenue, Bromley.
Fox, Miss B. M., 30 Station Road, Barnet.
Holland, Miss L. S., Ivydene, Ickford.
Lawson, Miss G., 54 St. Silas's Road, Blackburn.
Laycock, Miss M. E., 18 Beech Grove, Undercliffe.
70. Morris, J. E., Ivy Grange, Chilcompton.
Poole, T. W., 79 Noel Street, Hyson Green.
Robinson, Ethel, Petfield Farm, Minster.
Schoefield, J., School House, Kirby Malzeard.
Underwood, Miss E. M., 35 Bromboro' Road, Bebington.

Arthur, Brythonfryn, The Bungalow, Bargoed.
Barnes, Miss E. M., Station Road, Helmdon.
Bartlett, F. E., "Dundon," Torquay.
Coles, E. D., 28 Park Crescent, Bristol.
Croft, Miss G., 12 Stafford Street, Hull.
Daws, Miss H, 690 Fishponds Road, Bristol.
80. Edmondson, M., The Bungalow, Whorlton.
Evans, H. T., The Glen, Llantarnam.
Hancock, A., Council School, Bamford.
Harvey, Miss M., School House, Cherington.
Holmes, Miss L., The Mount, Burcot.
Lowrie, Miss I. M., Collingwood, Irchester.
Mercer, Miss M., 3 Coventry Road, Bedworth.
Morgan, Miss E. L., Bridgerule, North Devon.

Redford, Miss E., 22 Craighall Avenue, Levenshulme.
80. Sargent, Miss L., 67 Woolhope Road, Worcester.
Stephenson, S., 3 Albert Terrace, Peases West.

Brooks, Miss E., 13A Malvern Road, Leytonstone.
Chadwick, C., 6 Nursery Terrace, Belfield.
Furness, Miss H., 20 Holborn Street, Woodhouse.
Gray, F. C., Council School, Irchester.
Green, Miss A., 140 Stapleton Road, Bristol.
Knight, T. T., School House, Earlswood, Mon.
Lee, Miss M. A., 17 Lisburne Road, Hampstead.
97. Locke, Miss M. A., Stonesby School House, Leicestershire.
McLearn, J., All Saints School, Marple.
Richards, T. M., 28 Broniestyn Terrace, Aberdare.
Shopland, Miss A., School House, Bredenbury.
Tipper, D., School House, Black Dog.
Webber, Miss G., 12 Demesne Road, Wallington.
Whiting, Miss L. G., 60 Foxhall Road, Ipswich.

Cooke, D. G., 110 Victoria Street, Bristol.
Crossley, Miss S. J., 107 Market Street, Shawforth.
Jenkins, D. R., 267 King Street, Brynmawr.
Martin, Miss J. E., Church Road, Whittington.
Mitchell, Miss P. G., School House, Warninglid.
111. Morgan, L., Penpound, Cymmer.
Passmore, Miss E. M., 14 Holden Road, Wednesbury.
Pullen, Miss R., 7 Monson Road, Harlesden.
Stokes, Miss E. S., 9 Athol Park, Sunderland.
Watson, J. W., 22 Queen's Road, St. George.

Applegarth, W. B., West Blackdene, Durham Co.
Coe, Miss J. M., 72 Queen's Road, Bury St. Edmunds.
Dale, Miss E., The School House, Carburton.
Hill, C., Rosemont, Lincoln.
121. Killeen, Miss J., 453 Stanhope Road, Tyne Dock.
Long, Miss M. M., 65 Argyle Road, West Ealing.
Potter, W. J. H., 77 Devonshire Road, Bristol.
Ryan, J. J., Knockaney N.S., Bruff.
Williams, Miss G. L., Newlyn, Brands Hill.

Dobson, J. C., School House, East Stanley.
Henn, F. L., 18 Pitchford School House, Condover.
Hulme, Miss R., School House, Chaddesley Corbett.
130. Knight, Miss L. B., Fivehead School (C. of E.), Taunton.
Marshall, Miss E. O., Maycroft, Ballafesson.
Stinson, Miss F. M. E., 43 Leonard Street, Hull.
Stubbs, E. L., School House, Orleton.

Foulger, C. B., 12 Beaufort Road, Weston-super-Mare.
Godden, G. H., 78 Dunbar Road, Wood Green.
137. Gosling, S., Claygate, Newark.
Gough, A. J., 21 Alfred Street, Tamworth.
West, J. H., Swansea, South Wales.

137.
- Hill, W. H., Marlborough House, Bradford.
- Holland, Miss S. K., Northfield College, Birmingham.
- Kennett, W. H., Llangibby, Newport, Mon.
- Kerry, Miss E. B., School House, Chittering.
- Kerswill, Miss J., 115 Sefton Park Road, Bristol.
- Montgomery, Miss M. H., 30 Trevor Road, Hitchin.
- Richards, Miss M., Moreton C.E. School, Newport, Salop.
- Stone, C. J., Ivy Cottage, Tettenhall.
- Winship, Miss D. E., 75 Belmont Road, Southampton.

151.
- Aves, Miss A. G., Ashby-de-la-Zouche, Digby.
- Dixon, J., 22 Whitehall Road, Gateshead.

153.
- Folland, Miss E. M., School House, Bramley.
- Guest, W., 26 Waterfall Lane, Old Hill.
- Ives, Miss J., 341 East India Dock Road, E.
- Lambert, Miss M., 106 Belvedere Road, Burnley.
- Pearcy, Miss M. G., 5 Bond Street, Halifax.
- Pearson, Miss J. W., Sunnyside, Coleorton.
- Roast, Miss M. A., Barnston School, Dunmow.
- Smith, B., Ammanford, South Wales.

161.
- Jenkins, Miss M., 9 Tyrfran, Llanelly.
- Loftus, F., Wensley School House, Leyburn.
- Warren, Miss G., 109 Regent Street, Watford.
- Watson, S. A., 18 Shelton Road, Merton Park.

165.
- Arthur, J. H., The Bungalow, Bargoed.
- Berryman, L., Audley, St. Just.
- Gibson, Miss F. A., 5 Harcourt Road, Boscombe.
- Hansford, Miss M. K. M., Askerswell C.E. School, Dorchester.
- Jones, A. G., Park Hurst, Pontymoile.
- Molyneux, Miss B. E., 122 Hainton Avenue, Grimsby.
- Robinson, Miss M. A., School House, Burnett.
- Smith, Miss M. H., Morden Cottage, Oulton Broad.

173.
- Clay, Miss L., 11 London Road, Pulborough.
- Howard, Miss E. G., 94 Ripple Road, Barking.
- Turner, Miss E. V., School House, Westmeston.

176.
- Burrows, Miss M. E., 175 Walshaw Road, Elton, Bury.
- Collings, H., The Cedars, Undy, Magor.
- Elgar, A. J., 30 Colworth Road, Leytonstone.
- Miller, Miss F. A., School House, Moccas.
- Neal, Miss M., Hawthorns, Chelwood Gate.

181.
- Bevington, Miss D., 82 Nunsfield Road, Fairfield.
- Nicholson, Miss H., School House, North Ballachulish.
- Rushworth, Miss E., 9 Nelson Road, Whitstable.
- Stephens, W. T., 21 Tynewydd Street, Pontlottyn.
- Stevenson, L., 98 Mitchell Street, Rochdale.

186.
- Bullock, Miss F. E., 14 Fitzroy Road, Fishponds, Bristol.
- Chapman, Miss W. M., Sheedy Camps, Bartlow.
- Dyer, E. C., Uphill School, Weston-super-Mare.
- Ellis, T. E., 32 Market Street, Rhos, Wrexham.

186. James, T. R., 173 Harold Road, Upton Park.
Kemp, Miss E., 3 Tower Parade, Tankerton.
Owens, Miss M. M., 53 Beaufort Road, Longton.
Senior, B., 32 Preston Street, Earlsheaton.

194. Higgins, J. P., Crumlin, Ballyglunin.
Jones, O. E., Anghorfa, Ystradgynlais.
Metcalfe, Miss H., Big Green, Penley.
Ross, Miss J. A., 45 Station Avenue, Fence Houses.
Todd, Miss E. M., Carbrayne, Newland Park, Hull.
Ware, C., Glancynlais House, Ystradgynlais.

200. Barkley, H. E., 31 Stanley Street, Heaton Park.
Govett, Miss D., 179 Albany Road, Roath.
Jenkins, Miss L., Cartref, Velindre.

203. Batley, Miss F. M. D., Garforth House Cottage, West Garforth.
Brown, Miss S. J., 43 Beach Avenue, Whitley Bay.
Davies, J., 11 Newport Road, Tre Thomas, Bedwas.
Fitz, Miss N. H. B., Braemar, Cranbrook.
Garraway, F. J., 30 Seymour Road, Walcot.
Law, R. R., Sharneyford Council School, Bacup.
Lewis, W., Council School, Rhydcwmerau.

210. Rolfe, Miss M., Shell Cottage, Cheveley.

211. Growthorpe, Miss L. A., Marishes School, Malton.
Lloyd, T., Tyllwyd, Ystrad Mynach.
Perham, Miss L., Glen Road, Fleckney.
Smowton, P. J., 80 Nelson Road, Great Yarmouth.
Thomas, J. R., 34 High Street, Rhos.
Title, Miss L. E., 10 Andee Street, Dublin.

217. Huntley, Miss E. L., Kelmscott Schools, Lechlade.
King, Miss F. M., Manton, Marlboro'.
Molyneux, Miss D., 122 Hainton Avenue, Grimsby.
Peacock, N., 3 Whitby Street, Hartlepool.
Robinson, J., 13 Commercial Street, Thornton.

222. Chaloner, R., 7 Lime Street, Levenshulme.
Christmas, J., 35 Gordon Road, Blackwood.

224. McConachie, Miss M. L., Franklin House, Meadowfield.
Daly, Miss J. M., 54 Grosvenor Square, Rathmines.
Eastland, Miss E. H., 14 Carlton Gardens, Herne Bay.
Green, Miss C. S., Sheffield Road, Erdington.
Norris, W. A., West View, Darlaston.

229. McIntosh, P., 20 Burnell Road, Esh Winning.
Ouzman, Miss F., Holmswood, Gosberton.
Powell, Miss D., 2 Palmerston Terrace, Worthing.
Whitley, Miss S., 557 Rooley Lane, Bradford.

R.H.S. GENERAL EXAMINATION.

March 14, 1917.

Seniors.

Eighty candidates entered for the Society's Senior General Examination held on March 14, 1917. Three of these, however, did not present themselves on the date appointed, and one was not placed.

The Examiners, the Rev. Prof. G. Henslow, M.A., V.M.H., and Mr. James Hudson, V.M.H., report that of the Senior candidates 19, or 24 per cent., were considered worthy of a place in the First Class; 26, or 32 per cent., in the Second Class; and 31, or nearly 40 per cent., in the Third Class.

In Section A (Principles) the first question, on minerals useful to plants, and the fifth and sixth, on the physiology of the cell, were particularly well answered. Some few discussed Mendelism in connexion with varieties appearing naturally; but Mendelism deals with the results of *crossing*, and the question referred to "fixing" without crossing.

In Section B (Horticultural Operations and Practice) some few gave good practical answers to questions nine, eleven, and fourteen, whilst of those who attempted the tenth and the sixteenth there were several excellent replies, which showed a sound knowledge of the principles concerned. This was particularly the case with question sixteen, in which actual experience was evident in the best replies. Taken as a whole the replies showed careful training in the practical work. Indeed, it was a pleasure to read most of them.

Juniors.

Only eighteen candidates entered for the Junior Examination, and of these one secured a Second Class, eleven a Third, and six a Fourth Class.

The replies were not so good as last year, but nevertheless those who entered must not be discouraged in their first attempts. A little more practice will stand them in good stead.

March 31, 1917. W. Wilks, *Secretary R.H.S.*

Seniors.

Class I.

1. Hartley, V. Gaskell, 2 Claremont Terrace, Hextable.
2. Hawkins, L. M., Thatcham Fruit Farm, Newbury.
3. Barbour, Moya, Studley College, Warwick.

4. Slaney, Margaret O., Studley College, Warwick.
Exley, Doris, Thatcham Fruit Farm, Newbury.
Easton, May H., Thatcham Fruit Farm, Newbury.
7. Walrond-Skinner, Judith, Studley College, Warwick.
8. Green, Alice, 140 Stapleton Road, Bristol.
Athron, D. Lister, 101 Southlands Road, Bromley Common.
Bliss, M. M., Grange-over-Sands.
Newman, P. Rutherford, Thatcham Fruit Farm, Newbury.
Horsnaill, C. Ruth, Thatcham Fruit Farm, Newbury.
Peirce, T. A., Green House, Ivybridge, Devon.
Squire, Emily A., Training College, Norwich.
15 Dow, Elizabeth G., Aldersey Hall School, Handley.
Wheeler, E. S. Cornelius, Aldersey Hall School, Handley.
Glover, Hilda K., Studley College, Warwick.
Ainger, Kate L., Thatcham Fruit Farm, Newbury.
Moses, Marjorie H., Elmdene, Berkhamsted.

Class II.

1. Hughes, Dorothy K., Wolsley Lodge, Feltham.
Cameron, Nancy, 21 Cleveland Square, Hyde Park, W.
Snow, Nancy, Studley College, Warwick.
Catchpole, Mildred E., Thatcham Fruit Farm, Newbury.
5. Owen, Phyllis M., 2 Claremont Terrace, Hextable.
Penrose, Iris C. C., Thatcham Fruit Farm, Newbury.
Hardy, Frances E., Deanfields, Londonderry.
Jameson, Ella W., Park Road, Chelmsford.
9. Edwards, Eveline M. B., Sloperton, Chippenham.
Ellis, Beatrice E., Aldersey Hall School, Handley.
Moore, Helen I. S., Woodfield, Malvern Wells.
12. Dyke, D. E. L., Eastfield, Flax Bourton, nr. Bristol.
Mogg, George, 483 Fishponds Road, Bristol.
Langdon, Ethel C., West Lodge, Hastings Road, Bexhill.
Wrigley, Katherine, Studley College, Warwick.
16. Glegg, Nancy, Aldersey Hall School, Handley.
Ozanne, Eileen, Iver, Bucks.
18. Barns, M. E., Pound Hill, Worth, Sussex.
Dunbar, Rose, 6 Gordon Terrace, Edinburgh.
Byars, Jean M., 2 Alfred Place, St. Andrews, N.B.
Lawrence, Nathalie, 33 Greville Road, Maida Vale.
Trench, Ailene A. C., Rathfarnham, co. Dublin.
Mitchell, John S., Newmarket Street, Usk.
24. Gardner, Elizabeth S., Studley College, Warwick.
Dixon, Annette H. O., Studley College, Warwick.
Mitchell, Carrie, 46 Third Avenue, Selby Park, Birmingham.

Class III.

1. Hill, Olive F., Woodlands, Lustleigh, S. Devon.
   Godson, Muriel L., Studley College, Warwick.
   Landan, Mary, Grove End Road, St. John's Wood.
   Grey, Constance M., 16 Meadway Court, Hampstead Garde City.
5. Cran, Agnes V., Backhill House, Carberry, Musselburgh.
6. Taylor, Doris E., 20 Effingham Road, Lee, S.E.
   Binyon, Janet, Clapham, Worthing.
8. Landan, Alice, 28 Grove End Road, St. John's Wood.
9. Prichard, Audrey, Chiltern House, Chesham, Bucks.
   Kitt, Edith, 95 Congreve Road, Eltham.
11. Hannon, Dorothy, 17 West Park, Clifton, Bristol.
    Neal, Muriel, Skeffington, Foxley Lane, Purley.
    St. John Toms, Hilda, Wall Hall, Aldenham.
14. Denniston, Helen, 4 Threadneedle Street, E.C.
    Brookes, Annie H., St. James's Gardens, West Malvern.
16. King, Alfred, 273 York Terrace, Southampton.
17. Gilbert, John, Lednock Bank, Comrie.
    Dickens, Annie M., 106 Corporation Street, Birmingham.
19. Durham, R., Farley Court, Reading.
    O'Reilly, J. P., 114 Park Road, Burslem, Stoke-on-Trent.
    Swinstead, W. L., 45 Heath Hurst Road, Hampstead.
22. Sadler, Daisy B., Hartham Park, Corsham, Wilts.
23. Howes, Dorothy G., Norwich Road, N. Walsham.
    Wilson, B. T., Scroggs Bridge, Staveley.
25. Acworth, F., Amersham, Bucks.
26. Roberts, John, 8 Reedley Terrace, Reedley, Burnley.
    Marshall, Ottoline, 6 Hamilton Road, Harrow.
    Griffiths, W. S., Burry Port, Carmarthen.
29. Ferneyhough, F., 46 Devonshire Road, Bristol.
    Gifford, A. H. B., Iver, Bucks.
    Price, Isobel, Felix Hall, Kelvedon, Essex.

JUNIORS.

Class II.

1. Lamphard, W. H., Downside, Leatherhead.

Class III.

1. Smith, R., Double House, Bower Ashton, Bristol.
2. Bevan, C. W. H., Tredegar Park, Newport.
   Ainger, H. C., 17 Bloomfield Road, Chelmsford.
4. Harris, W. F. E., Lostock, Bolton.
5. Burgess, F., Lostock, Bolton.

6. Taylor, R., Lostock, Bolton.
7. Hoyle, H., Lostock, Bolton.
8 Calcraft, R. H., Lostock, Bolton.
9. { Shillito, F., Lostock, Bolton.
Jones, M., Letheringsett, Holt, Norfolk.
11. Masheter, A., Lostock, Bolton.

Class IV.

1. { Wood, F., 12 Marshfield Road, Goole.
Owens, J. R., Lostock, Bolton.
3. Dugdale, J., Lostock, Bolton.
4. { Cotterill, F., Lostock, Bolton.
Bocking, H., Lostock, Bolton.
6. Brook, R. J. R., Lostock, Bolton.

COMMONPLACE NOTES.

A FINE JUDAS TREE.

IN Vol. XLI., p. 5, of this JOURNAL Mr. IRWIN LYNCH referred to the remarkably fine Judas Tree (*Cercis siliquastrum*) at the Botanic Garden, Cambridge, measuring 27 ft. 6 in. in height. Mr. H. E. LUXMOORE, of Eton, writes that a tree in his garden is even taller though of less circuit of branches. It measures 29 ft. 2 ins. in height, and has freely sown its own seeds on more than one occasion.

CONFERENCE ON ALLOTMENT GARDENING.

A Conference of the Society's Special Horticultural Lecturers from all over the country who are engaged in furthering the Food Production Campaign upon which the Society embarked at the beginning of August 1914, and which it has been carrying on vigorously ever since, was held for a fortnight at Wisley from September 24, 1917. It was under the direction of Mr. F. J. CHITTENDEN, Head of the R.H.S. Laboratory and School of Horticulture, Mr. A. S. GALT, Horticultural Organizer for Yorkshire, and Mr. C. WAKELY, Horticultural Instructor in Essex. As it was the first of its kind, the programme, which we give below, may prove of interest.

PROGRAMME.

Monday, September 24.

2 P.M.– 5.	Introductory Remarks. F. J. Chittenden. The Value of an Allotment. Quarter of an hour addresses by F. J. Chittenden, A. S. Galt, C. Wakely. Brief inspection of the Wisley Garden.

Tuesday, September 25.

9.30 A.M.	The Soil; its Nature and Structure. F. J. Chittenden.
10.30 A.M.–12.30.	Ground Work. C. Wakely.
2 P.M.– 5.	The Laying out of Allotment Plots, Position, Size, etc. Protection. A. S. Galt. Exhibition of Onions.

Wednesday, September 26.

9.30 A.M.	The Soil and the Plant—the Air Supply. F. J. Chittenden.
10.30 A.M.–12.30.	Cultivation. A. S. Galt.
2 P.M.– 5.	Hardy Fruits—Bush Fruits. C. Wakely. Demonstration on Pruning.

Thursday, September 27.

9.30 A.M.	The Soil and the Plant—the Water Supply. F. J. Chittenden.
10.30 A.M.–12.30.	Onions and Leeks for Allotment Gardens. C. Wakely.
2 P.M.– 5.	Potato Cultivation. A. S. Galt. Exhibition of Potatos.

Friday, September 28.

9.30 A.M.	The Soil and the Plant—the Nitrogen Supply. F. J. Chittenden.
10.30 A.M.–12.30.	Beans for Allotment Gardens. A. S. Galt.
2 P.M.– 5.	Cabbages and the Cabbage tribe. C. Wakely.
	Exhibition of Potatos continued.

Saturday, September 29.

9.30 A.M.	The Soil and the Plant—the Supply of Earth Salts. F. J. Chittenden.
10.30 A.M.–12.30.	Parsnips, Carrots, and Beet for Allotment Gardens. A. S. Galt.

Monday, October 1.

9.30 A.M.	Seed-Sowing. F. J. Chittenden.
10.30 A.M.–12.30.	Other Root Crops for Allotment Gardens. A. S. Galt.
2 P.M.– 5.	Hardy Fruits—Plum and Apple. C. Wakely.
	Demonstration on Tree Forms.

Tuesday, October 2.

9.30 A.M.	Spacing. F. J. Chittenden.
10.30 A.M.–12.30.	Salads for Allotment Gardens. C. Wakely.
2 P.M.– 5.	Arrangement of Crops on Allotments. A. S. Galt.
	Exhibition of Apples.

Wednesday, October 3.

9.30 A.M.	Food Values. F. J. Chittenden.
10.30 A.M.–12.30.	Disposal of Allotment Garden Produce. A. S. Galt.
	Co-operation among Allotment Holders. C. Wakely.
2 P.M.– 5.	Successional and Intercropping in South. C. Wakely.
	Successional and Intercropping in North. A. S. Galt.
	Demonstration on Transplanting.

Thursday, October 4.

9.30 A.M.	Spraying. F. J. Chittenden.
10.30 A.M.–12.30.	Storing and Winter Keeping of Vegetables. C. Wakely.
2 P.M.–5.	The Potato Disease and the Results of Spraying. A. S. Galt.
	Making of Burgundy Mixture.
	Exhibition of Spraying Instruments.

Friday, October 5.

9.30 A.M.	Mistakes Lecturers make. F. J. Chittenden.
0.30 A.M.–12.30.	Soil Pests. A. S. Galt.
2 P.M.– 5.	Seed Economy and Seed Saving at Home. F. J. Chittenden.
	Exhibition of Beets.

Potatos on Bracken Land.

The war has led to the making of many experiments, and not the least interesting are those connected with the treatment of the land. Mr. John A. A. Williams, of Aberglaslyn Hall, Beddgelert, N. Wales, tells us of a particularly interesting one made by him on bracken-infested land there. The land was broken up and the ashes of burnt bracken, together with a little basic slag, were strewn upon the ground as manure—nothing else. Potatos were then planted and grown on in the usual way, giving an excellent crop. Such land in Ireland, too, when broken often produces good results with potatos. Bracken ashes, it may be noted, so long as they have not been exposed to the weather, contain a fair amount of potash.

BOOK REVIEWS.

"The Principles of Plant-Teratology." By W. C. Worsdell. Vol. II. 8vo. 53 plates, 296 + xvi pp. (Ray Society, London, 1916.) 25*s*. net.

The features that characterized the first volume of this important work are characteristic also of this, the final one, dealing with the teratology and origin of the flower and fruit. The various stages by which the most highly developed flowers of the present day have reached their special form are discussed in the light thrown upon the subject by the malformations which so frequently occur and which, naturally, attract the attention of the curious. Two types of inquirer will find much to interest them in the present section of the work—those whose interest lies mainly in noting aberrations in floral structure, such as doubling, proliferation, and the like, and those who look to such changes to aid in explaining the origin of the parts of the flower from primitive forms. The latter especially will find the discussions of the various views that have been expressed from time to time, with the bibliographies which form a feature of the book, of great value, and both will find interest in the clear plates some of them well coloured) for which all the publications of the Ray Society are remarkable.

"Plants, Seeds, and Currents in the West Indies and Azores: The Results of Investigations carried out in those Regions between 1906 and 1914." By H. B. Guppy, M.B., F.R.S.E. (with three maps, and frontispiece of West Indian Drift Seeds and Fruits brought to the shores of Europe.) 8vo. 531 pp. (Williams and Norgate, London, 1917.) 25*s*. net.

This great work consists of 440 pp. of text, 50 pp. of appendix, and a general index of 27 pp. Of the nineteen chapters, i. and ii. deal with West Indian Currents; iii. and iv. Atlantic Currents; v. The Mangroves in Jamaica; vi. and vii., xi. and xii. The Drifts of the Turks Islands, near the Bahamas; viii.-x. Miscellaneous Plants; xiii. Currents of the Southern Hemisphere; xiv. Differentiation in Plants; xv. Their Distribution; xvi. The Distribution of *Carex* and *Sphagnum*; xvii.-xix. The Azores.

The first four chapters dealing with currents require the first eighty-three pages and contain a large mass of data, as to the means of mapping the surface or drift currents. Two methods are fully described: the natural discharge by rivers of seeds and fruits into the oceans, and experiments with bottles thrown overboard at certain places and then recovered elsewhere.

The final result is excellently displayed on a map.

The great main currents run in the tropics from east to west, being due to the rotation of the globe from west to east. Wherever there is an "open" space, the current rotates. Counter-currents and drifts occur in many places, according to the configuration of the land. An important one runs from west to east, all round the south of Australia, South America, and South Africa.

Each chapter concludes with a useful summary; chapters xiv. and xv. deal with "Differentiation" [Evolution] and Distribution of Plants. The author assumes the former existence of "primitive, world-ranging generalized types," the differentiation of which was "in response to the differentiations of their conditions." "Natural families seem to fall into two groups, the primitive and the derivative." But the author does not explain why some are primitive, nor what this word implies, especially as he includes the Compositae, which many botanists regard as the *last* family to have been evolved. He does not refer *to the structure of flowers,* upon which evolution so largely depends, but to the *wide distribution.* Again, he seems to think that the insectivorous families, Sarraceniaceae, Nepenthaceae, and Droseraceae are, on that account, allied; whereas, according to Bentham and Hooker, they are situated widely apart, the similar structures having like causes only.

In dealing with longitudinal distribution the author follows Gray and Dyer, considering that the Arctic regions supplied many plants which descended along certain longitudes, so that certain Japanese plants are allied to plants on the east side of North America; such as the Ampelopsis species, and that other plants spread down the three continents to the south temperate zone. But there are many links between Australasia, the Cape, and South America, and it is more probable that the former Antarctic continent supplied a common source for certain species of *Pelargonium, Adansonia,* &c., for the sea-soundings reveal ridges extending to the three continents at a depth of 2,000 fathoms, while the sea is 3,000 fathoms between the continents.

"The Carnation Year Book." Edited by J. S. Brunton. 8vo. 68 pp. (Hortus Printing Co., Burnley, 1917.) 1*s.* 6*d.*

It is inevitable that the Year Book of any Society should contain a considerable amount of material of more or less ephemeral interest, such, for example, as lists of prize-winners; but, as has been done here, more permanent value may be given to such lists by noting the composition of prize-winning groups and so on. In addition to these lists, and information relating to the Society, articles by its members add to the interest of this little book, which is the organ of the Perpetual Flowering Carnation Society, and particularly valuable is the list of Carnations registered by the Society with the raisers' names.

"Name this Flower." By G. Bonnier. Translated by G. S. Boulger. 8vo. xii + 331 pp. (Dent, London, 1917.) 6*s*. net.

This simple handbook will be welcomed by many who desire an easy way to knowing the name of the common wayside flowers, for it is easy to use, and reliable. We have tested it for a number of flowers of different groups and found it always to lead to the name with a minimum of trouble and (if the simple directions are followed) with certainty. The learned author has, of course, dealt with the common plants of France, but the translator has added a few, so that the common plants of Great Britain are all here. Does one find a plant with a white flower and a rosette of red, stalked, round, hairy, sticky leaves? Turn to page 2 and we are asked (1) to decide whether it is a plant which bears flowers or not and directed to (2). Is it herbaceous or not? Are the flowers arranged in close heads or not? Are the flowers red, white, etc.? (to No. 506). Are they arranged in an umbel (illustrated) or not? (507). Is the flower regular or not? (508). The shape of the leaves? Their arrangement? and so on, until at last we are led inevitably to the Common Sundew, which is briefly described and neatly figured. Coloured figures are given of several plants and an annotated Index of English plants with their uses, etc., which add very much to the value and interest of the book.

"Manual of Fruit Diseases." By L. R. Hesler and H. H. Whetzel. xx + 462 pp. 8vo. (Macmillan, New York, 1917.) 8*s*. 6*d*. net.

The authors candidly state what every plant pathologist feels, that "the best possible book on fruit diseases cannot entirely meet the situation," that is, the needs of "every fruit-grower regarding his many problems." Nothing can take the place of personal inspection and the specific advice of a competent pathologist furnished with full information upon all the facts of the case. A good book used with discretion is the next best thing, and this the authors have produced for the American public. That all the facts, or their relative importance, will be the same on this side of the Atlantic as on that is unlikely, but that they will be suggestive to the fruit-grower is certain. The fruits dealt with are apple, apricot, blackberry, cherry, cranberry, currant, gooseberry, grape, peach, pear, plum, quince, raspberry, and strawberry. The account of the several diseases of each of these fruits is followed by a chapter on fungicides, and an appendix on books and meanings of terms. Perhaps the most troublesome disease of the apple in England is that known as scab, caused by the fungus *Fusicladium dendriticum*, and to be controlled here by the careful pruning out of dead and dying spurs and branches, and by two sprayings with Bordeaux mixture (or in the case of tender-leaved apples, such as Cox's Orange, with lime-sulphur), one before the buds burst, the other just after the petals fall. The form on the apple twigs appears to be rare in America, and the recommendations as to pruning are thus omitted from the account given by the authors, dependence being

placed upon the collection of fallen leaves and spraying with lime-sulphur, the concentrated solution (testing 32° Baumé) being diluted with forty times its bulk of water. Similar small differences will be found with other diseases, but comparisons with European conditions are often made, and this adds to the value of this book to English readers. One of the authors spent a considerable time in Europe and made himself familiar with the diseases of plants here, and he has used the knowledge thus gained to great advantage.

The authors deal not only with the diseases due to fungi and bacteria, but also with such things as "glassiness," "bitter-pit," "Jonathan spot" of apples, all of which are too familiar in this country, and none of which, alas, have so far been completely and thoroughly investigated. The illustrations are excellent, and we have nothing but praise for this work from beginning to end.

"British Insects and how to know them." By Harold Bastin. 8vo. ix + 129 pp. (Methuen, London, 1917.)

There is no better brief review of British Insects than this useful little volume. The plan of it is to describe the general structure of insects, and the marks that distinguish them from their nearest allies; then to take each large group of insects, as the butterflies and moths; the curious little wingless insects most simple of their kind and possibly most primitive; the beetles; and so on; devoting a chapter to each. The principal characteristics of each group are mentioned and the main variations within the group, with a short account of the common members of it which are more likely to be met with by even the casual inquirer into the living creatures of the countryside. Several plates help to give an idea of the insects dealt with, and increase the usefulness and value of the book greatly.

"The Wild Foods of Great Britain; Where to find them and how to cook them." By L. C. R. Cameron. 8vo. xiii + 128 pp. (Routledge, London, 1917.) Paper covers, 1*s.* 6*d.* net.

The organic kingdom in almost all its branches is drawn upon to provide material for this little book, and even the caterpillars of the cabbage butterflies are said to be "a real delicacy" if "lightly cooked in boiling butter, and sprinkled with pepper and salt." We fear the materials required for making many of the dishes, such as this, palatable, will be beyond the means of the very poor, for whom the book is intended. For those, however, whose means permit, and who have a *penchant* for trying new dishes, this little book will prove a complete guide. The author is careful to point out the necessity for condiments and gives a long list; and, moreover, he is also careful to say that the cooking of these wild and war-time rations calls for not a little trouble—trouble perhaps rarely expended upon the cooking of ordinary foods in ordinary homes.

"The Cultivation of Allotments." By P. Elford and S. Heaton. 8vo. 62 pp. (Clarendon Press, Oxford, 1917.) Paper covers, 8*d.* net.

Not a little good has been done by the publication of booklets on Allotment Gardening during the present year, and especially valuable have they been when they have been intended for certain definite districts and have dealt with crops which have been found to "do well" in those districts. The present is one of this type, and very good it is. The only fault we have to find with it is that it makes no attempt to show which crops are the most valuable as foods; which, that is, give the greatest return for the amount of soil occupied by them, and for the cost of seed and cultivation—no, not quite the only fault, for we cannot but regard the practice of burning turf as a very wasteful one, not to be recommended even in the case of heavy soil. If it is too rough and full of perennial weeds to turn in, then it is better to stack it for future use. The weeds will die if stacked closely and rot down to a useful manure. Apart from these little criticisms, we have nothing but praise for this most useful little book.

"Food Gardening for Beginners and Experts." By H. V. Davis, B.Sc. 8vo. 44 pp. (Bell, London, 1917.) 6*d.* net.

"Vegetable-Growing in War-Time." By H. Cowley. 8vo. 30 pp. (Country Life, London, 1917.) 6*d.* net.

These are two further useful little handbooks on vegetable-growing giving both general and detailed information on the management of kitchen-garden crops. Neither of them makes enough of the sowing of such things as beet, carrot, and other crops in July, although successional cropping is dealt with in both. In the former book too much is promised in some cases. Rarely indeed can peas sown on March 3 be harvested on June 2, and cleared away on that date to be followed by dwarf beans, which in their turn are disposed of by September and their place taken by swedes or turnips. September is, in most places, too late to sow swedes, and first-early peas, even in our own warm soil in a warm district, sown in the open in the middle of January never give us a first picking before June 5 or 7 and are not ready to clear away until the third week in the month. Strangely enough, too, neither mentions the sowing of onions in August for transplanting next year: that best of all methods for circumventing the onion-fly. And on the question of onion-growing there is a diametrical difference of direction: the one book tells us to keep the hoe going; the other instructs us on no account to use the hoe! We are inclined to think sugar-beet will not find a permanent place as a garden crop as a substitute for sugar or for use as a vegetable, but for those who incline to try it a long paragraph in the former book gives directions. It is not to be dug up till October, and by that time most of the fruit used for jam-making in the household will have passed its prime, unless it has been "pulped"—a process little understood in most households, though common enough in the jam-factory.

"British Wild Flowers: Their Haunts and Associations." By W. Graveson. 8vo. 320 pp. With fifty plates, illustrating over one hundred species. (Headley, London, 1917.) *7s. 6d.* net.

This work consists of twenty-eight chapters, referring to wild flowers in different months, as well as in clover fields, chalk hills, sea cliffs, woods, riverside, moor and mountain, salt marshes and dunes.

There is a monthly Floral Calendar (31 pp.), Index to Flowers (8 pp.).

This book is *not* "intended for the study of botany," but as an agreeable companion for the dilettante. Numerous interesting facts about many wild flowers are culled from some seventy writers, among whom Gerard and Shakespeare stand foremost.

The illustrations, coloured and plain, are valuable additions to the volume.

"The Early Naturalists: Their Lives and Work" (1530–1789). By L. C. Miall, D.Sc., F.R.S. 8vo. 396 pp. (Macmillan, London, 1912.) 10*s.* net.

This is a valuable work. It is divided into nine sections, headed as follows: (I.) The New Biology, "The Revival of Botany, from Brunfels to Rondelet" (to 1566). (II.) The Natural History of Distant Lands (to end of sixteenth century). (III.) Early English Naturalists and O. de Serres (1619). (IV.) Ray, Willughby, and Lister (1712). (V.) The Minute Anatomists, Hooke, Malpighi, Grew, Swammerdam, and Leeuwenhoek (1723). (VI.) Early Studies in Comparative Anatomy; Redi, Perrault, and French and English Contemporaries (1708). (VII.) The School of Réaumur (1892). (VIII.) Linnaeus and the Jussieus (1778). (IX.) Buffon (1789, and later). Index.

Dr. Miall is so well known as an accurate scientist that we need only say that all the sections are equally and thoroughly well done, concisely but efficiently.

"Field Crops for the Cotton Belt." By James Oscar Morgan, M.S.A., Ph.D., Professor of Agronomy in the Agricultural and Mechanical College of Texas. 8vo. xxvi + 456 pp. With 75 illustrations in the text. (Macmillan, New York, 1917.) *7s. 6d.* net.

This addition to the "Rural Science Text-books" is on the same lines as the previous volumes of this valuable series, and as its title implies it treats of field-crops suitable for cultivation within the area where cotton is the principal crop. About one-third of the total number of pages is devoted to cotton, the other crops dealt with being maize or Indian corn, oats, wheat, rye, rice, sorghums (millets), sugar-cane, and pea-nuts, or ground-nuts as they are called in this country. Although the climatic conditions that prevail in the cotton belt of the United States of America are different from those in this country, there is much that the British farmer and agricultural student could earn regarding certain of the crops mentioned, for the author quite

correctly points out that the student who is unfamiliar with the crop and its life-processes is ill-prepared for a proper study of the tillage practices involved in the production of the crop. For this reason special attention has been given to plant structure and nutrition, and numerous chemical analyses of the crops are quoted, together with formulas for suitable fertilizers. Probably the book will appeal more to the farmers and students in the Colonies than to readers in this country, and to such it can be strongly recommended.

"Manual of Gardening in New Zealand." By David Tannock, F.R.H.S., Supt. of Gardens and Reserves, Dunedin, and others. 8vo. 298 pp., illustrated. (Whitcombe and Tombs, London and Christchurch, N.Z., 1917.) 5*s*.

This manual has been prepared to supply a demand for a book specially devoted to gardening in New Zealand, where, owing to different conditions, English books are not altogether suitable, especially as regards the varieties of plants recommended for cultivation.

As an instance of the variety of climatic conditions prevailing in New Zealand, it is mentioned that sub-tropical Auckland in the north has a mean maximum temperature of 63·9° F. and a mean minimum temperature of 51·6° F., whilst Invercargill in the south has a mean maximum of 58° F. and a mean minimum of 41° F. It thus follows that in the north Hippeastrums, for example, can be grown as hardy bulbs in the open border, whilst in the south they require a greenhouse.

The manual treats of all branches of gardening, and there are chapters by specialists on hardy bulbs and garden foes, on vegetable and fruit growing, and on rose growing for exhibition. One of the most interesting chapters to the English reader is that relating to the native plants of New Zealand, which the author points out have hitherto been neglected by New Zealand gardeners. It is interesting to learn in this connexion that since the red manuka (*Leptospermum Nichollii*) received the gold medal as being the most meritorious new plant at the International Horticultural Exhibition held at Chelsea a few years ago, the native plants of New Zealand are becoming prominent features in all the public gardens of the country. It is to be hoped that this recognition will result in the more extended cultivation of these plants by private persons; they are numerous in species and varied in their character, comprising trees, shrubs, alpines, and ferns, sufficient in themselves to stock a goodly sized garden. Most of them are greenhouse subjects in this country, although the Olearias and shrubby Veronicas, to mention but two families, are valued hardy shrubs.

The manual concludes with a calendar of garden work and a full index to the names of the plants mentioned. It is well printed in a generous type on good paper; the illustrations have been supplied chiefly by nurserymen and seedsmen in this country, and one could have wished that more photographs of New Zealand gardens had been included, and that those which are included had been named.

"Theophrastus: Enquiry into Plants." By Sir Arthur Hort. 2 vols. 8vo. (William Heinemann, London, 1916.) 10s.

This is the first English translation of the oldest work extant on plants in general, Hippocrates having written of them solely with regard to their medicinal values. This led Linnaeus to style Theophrastus the Father of Botany. He is supposed to have embodied in this book the teaching of his master Aristotle, from whom also he inherited the botanic garden formed by him in Athens.

The great importance of the work as the foundation of botanical science has been ably dealt with by Greene in "Landmarks of Botanical History," chap. ii., in the recapitulation of which he enumerates seventeen elemental truths of universal botany, recognized and clearly enunciated by Theophrastus.

It is astonishing how much he knew of the functions and structures of plants, considering that he had no aids to his natural vision for discovering them.

It is perhaps more as the owner and student of the first botanical garden, the keen observer of living plants, and the historian of the horticultural methods of his age that his book should be studied by modern garden lovers.

They will learn much, be reminded of numerous facts, and delighted with many a pleasing proof that the great Greek did not believe all he was told. Of this last class may be instanced the dignified way in which he terms irrelevant or absurd the superstitious practices enjoined to be observed when gathering certain herbs; such as dancing round the mandrake, repeating as much as possible about the mysteries of love.

Think of a Greek born in the fourth century B.C. knowing that "Slips for planting should be taken if possible with roots attached, or failing that, from the lower rather than from the higher part of the tree, except in the case of the Vine." Again for transplanting, "The holes should be dug as long as possible beforehand, and should always be deeper than the original holes, even for those whose roots do not run very deep." That the Almond, though it buds early, sheds its leaves late, while the Mulberry buds late and falls early. Leaves are smoother on the upper surface, having fibres and veins below, as the human hand has its lines. Asparagus has no leaves. The leaflets of the Ash were to be regarded as forming but one leaf, because all are shed at once.

He often writes "Some however say," followed by some quaint idea; such as that vine and pomegranate cuttings should be set upside down. But on his own authority he says the fig progresses more quickly and is less eaten by grubs if the cutting is set in a squill bulb. Root pruning is advised for trees that do not bear fruit but run to a leafy growth, and he knew of the separation of the sexes in the palm and fig.

One of the most interesting and astonishing facts revealed by a study of Theophrastus' book is the great number of plant names used

by him and still in common use. Many of them actually applied to the same plants—Anchusa, Anemone, Althaea, Antirrhinum, Arum, Asparagus, Adiantum, Daphne, Donax, Helix, Helleborus, Euonymus, Leucoium, Calamus, Cedrus, Cydonia, Crocus, Conium—to travel a little way down the alphabet.

Sir William Thiselton-Dyer undertook the identification of the plants, and there is an excellent and most interesting Index of such as can be determined.

The author has endeavoured to give us the ideas of Theophrastus in readable plain English, and to make it as nearly as possible a literal translation of the original. He has succeeded so well that while there is no difficulty in grasping the meaning, the spirit and charm of a Greek construction lingers in most of the sentences.

It is not perhaps a book to read straight through from cover to cover, but for all who care to know more about their plants than their monetary value and their exact shade of colour in a mass, there is a mine of pleasure ready to hand, and easily obtained by following up the references to one's favourites as given in the Index.

"Plants Poisonous to Live Stock." By H. C. Long, B.Sc. vii + 119 pp. 8vo. (University Press, Cambridge, 1917.) 6*s*. net.

Mr. Long has compiled from various sources a very interesting and valuable account of the wild plants and plants commonly cultivated in this country which are poisonous, or are suspected of being poisonous to man and animals. Many difficulties lie in the way of proof of poisonous properties, and even when this is forthcoming the isolation and identification of the poisonous principle is difficult, and has often not yet been accomplished with certainty. The present book must be regarded as a summary of what can be gathered from books, of which a long list is given at the end of the book.

Not a few of the commonest plants are at times or in some circumstances liable to cause trouble, the potato not being exempt, but not all are noted by the author. The roots, for instance, of the scarlet runner have been known to cause severe illness and probably death to horses which have eaten them; and, as the author frequently goes beyond the title of his book and includes plants poisonous to mankind, he might also have included the leaves of rhubarb, which, as is well known, often cause illness when eaten, even after cooking. He might also, since he mentions the irritation caused by handling Narcissi to the workers in the flower-fields, have made some reference to the very long list of plants, native or cultivated, in this country which cause more or less severe skin irritation or eruptions.

The book is very useful, but might thus have been made more complete. Tobacco, even, is omitted.

The general arrangement of the plants follows the order of Bentham and Hooker's Genera Plantarum; but it is strange to see the Castor-oil plant included among the Leguminosae.

As usual with the books published by the Cambridge University Press, the "get-up" of the book is excellent.

"Standard Cyclopedia of Horticulture." By L. H. Bailey. Vol. vi. S–Z and Supplement. 8vo. v + 3043–3639 pp. (Macmillan, New York, 1917.) 25*s*. net.

This great work is brought to a conclusion by this sixth volume dealing with genera of garden plants the names of which begin with one or other of the last eight letters of the alphabet, together with articles on such subjects as seeds and seed-growing, storage of plants, transportation, soils, and the like.

The supplement contains some interesting statistics, from which it appears that the Editor had over four hundred collaborators, and 12,493 species belonging to 3,214 genera, besides subsidiary notes and lists including 6,049 other species, and 12,458 synonyms are dealt with—truly a stupendous list!—and that the plants are dealt with well notices of the earlier volumes will have made evident.

The Supplement also contains a long list of names in common use among nurserymen and others for reference, together with a discussion on horticultural nomenclature. Finally an index to synonyms, vernacular names, and miscellaneous references which are not in alphabetical order in the Cyclopedia, brings the work to an end.

Only a man of great energy could have brought such a work as this to a successful conclusion, and when energy is united with knowledge, as it is in Prof. L. H. Bailey, and when also, as with him, to these is added the power of the teacher to put his points clearly and forcibly, and when also he is able to secure the collaboration of the ablest exponents of horticulture in America, a book of the greatest possible value may be expected, and those who go to it with the expectation of finding such a work will, we are sure, not be disappointed.

(1) "The Beginner's Gardening Book." (2) "The Allotment." (3) "Early Vegetables." (4) "Potatoes and Root Crops." (5) "The Garden Frame." (6) "Tomatoes and Salads." (7) "Profitable Small Fruits." By H. H. Thomas. (Cassell, London, 1917.) Paper covers, 7*d*. net.

These books form a series under the general title "Gardening Handbooks for Amateurs." They are on the whole very useful, well illustrated little books in attractive covers, but there are, naturally, many gaps which one would like to see filled, and a few things with which one cannot agree. The first deals with the whole of outdoor gardening, is necessarily very brief, and is not always quite clear to the beginner, and we regret to see no reference to bastard trenching, usually the best treatment for newly broken land which t is desired speedily to bring into good heart. It is, however, described in "The Allotment." In the latter a very good plan of cropping is given on p. 21, but, strangely enough, nothing is said there about beans, though they are very profitable and better in every way than peas for allotment gardens. "Early Vegetables" and "The Garden Frame"

bear a considerable resemblance to one another, as is to be expected, and a useful addition to both would have been an account of a method of making a hotbed without the aid of farmyard manure. Sprouting Potatos is recommended but clear directions are not given. Tripoli Onions are recommended, for autumn sowing, and very good bulbs are produced, but they will not keep. 'Bedfordshire Champion,' 'Giant Zittau,' 'Autumn Triumph' are all good for the purpose and far better keepers. "Tomatoes and Salads" is very useful, for it brings the growing of salads prominently before the beginner, who too seldom pays much attention to this branch of food production —a subsidiary but certainly an important one. "Small Fruits" is, again, a useful little book, but a warning against digging among raspberries would be an advantage.

"Allotments and Small Holdings in Oxfordshire." By A. W. Ashby. 8vo. viii + 198 pp. (Clarendon Press, Oxford, 1917.) 5*s*. net.

The publication of this "Survey made on behalf of the Institute for Research in Agricultural Economics, University of Oxford," at the present time is particularly opportune. The minds of many are occupied by the necessity for making more of the land than is at present made, and large numbers of those who consider the matter look towards the more intensive cultivation of the land to attain this end, with at least as much assurance as the more extensive. Furthermore, of the many schemes, existent and embryonic, for enabling those broken in the war to lead an independent life none is perhaps more attractive than land settlement.

The Survey is divided into two parts, the first dealing with allotments, the second with small-holdings. In each the genesis of the movements which led to their establishment is sketched, and the course of their development traced. The various Acts of Parliament governing them are clearly reviewed and the present state of the law on the matter lucidly explained.

The discussion of the condition of the allotments and small-holdings necessarily involves a far wider statement than would embrace the allotments and holdings of Oxfordshire alone, for the principles on which successful treatment of such holdings depends had to be sought and stated, and it is here, and in the commentary the facts given make upon them, that the peculiar value of the book lies.

The main difficulties in the way of success (apart from ignorance of cultivation) appear to be three: lack of capital, unwillingness to co-operate, or perhaps a suspicion of co-operation, and a tendency towards forming colonies of small-holdings remote from markets. Accessible markets are a *sine qua non* for successful small holdings, especially when failure to co-operate in placing goods on the market leads to waste of labour, time, and money in marketing. This same lack of co-operation increases the cost of working a holding, for expensive and little-used, but necessary, tools and labour-saving devices

are not communal possessions, but each holding must be self-contained. In other ways a small-holding is more expensive to work than a large one, and too often the small-holder is hampered at the outset by shortage of money or burdened by mortgages and the like.

Probably no one scheme would meet all cases, nor would rural credit banks solve the whole problem. Indeed, in all probability, until a community arises accustomed to conditions of life on small-holdings, able and willing to shake themselves free from fads and the anti-this-that-and-the-other-isms which seem to mark so many small-holding communities, and willing, too, to work as a community with a common aim and individual freedom to act in everything, except to the detriment of his neighbours, the small-holder will have a constant struggle, and it will take at least a generation to see this. One thing seems clear, that the future of the small-holding lies, not in making the holding a miniature farm, but in cultivating it with a special aim as a market or fruit garden, or in some other particular direction.

"The Herbaceous Garden." By Mrs. Philip Martineau. Ed. III. 8vo. xx + 298 pp. (Williams & Norgate, London, 1917.) *7s. 6d.* net.

We are glad to see this very useful book has gone to a third impression so quickly. It has not been added to since the publication of the edition which we reviewed in 1914, but some necessary revisions have been made.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

THE Editor desires to express his grateful thanks to all who have so willingly assisted in making abstracts. He would be glad if any who have time and who are willing to help in any special direction in making the abstracts more complete would communicate with him.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP IN THIS WORK.

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Whittles, W., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS.

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton	Ann. Rep. Agr. Res. Stn., Long Ashton.
Beiheft zum Botanischen Centralblatt.	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticultura	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal of the Society of Chemical Industry	Jour. Soc. Chem. Ind.

Journals, &c.	Abbreviated title.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.
† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Absorption in its Relation to Soils, The Phenomena of. A Résumé of the Subject. By J. A. Prescott (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—Included among absorption phenomena are the removal by soil of salts and colouring matters from solution; the deodorizing of liquid manure by sand; the replacement of NH_3 by Ca and Mg when a solution of sulphate of ammonia is shaken up with soil; the absorption of phosphate and bases by precipitated hydroxides of iron and of aluminium; the precipitation of a solution of humus in ammonia by salts of copper, lead, magnesium, and calcium; the absorption of potassium from its salts by a sphagnum moor soil with substitution of calcium and magnesium; the absorption by such a soil of water from a decinormal solution of potassic chloride, the concentration of the latter being therefore increased (negative absorption). The work of Way, Warington, Liebig, Graham, König, Ramann, van Bemmelin and others is reviewed, and a clear account of the most recent work on sols and gels is given. The conclusion drawn by the author is that there is a tendency to reject entirely the chemical explanation of Way and to associate all soil absorptions with the general phenomena of adsorption. A very interesting and helpful summary of the present state of knowledge of the subject.
J. E. W. E. H.

Alaska, Agricultural Experiment Stations, Report of 1914. By C. C. Georgeson (*U.S.A. Exp. Stn., Alaska*, July 22, 1915; figs.).—The grower in Alaska is very much at the mercy of the seasons. The climate is severe and unsuitable to many crops, and in interior Alaska it seems impossible to predict what the weather conditions will be. No two corresponding seasons seem ever to be alike within any reasonable period of years. All over the State the growing season is short at its best, and when it is still further shortened by early autumn frosts or much cloudy and wet weather during the ripening period the results are sure to be unsatisfactory.

Experiments have repeatedly proved that hardiness and earliness cannot be bred into cultivated crops by mere selection, at least during the average active life of a man. With some exceptions all the varieties of fruit trees and bushes imported from the States have proved unsuitable to Alaskan conditions. Alaska experiment stations are therefore called upon to create, by hybridization, acclimatized strains of all the economic plants. This bulletin gives an account of the experimental breeding work of the various stations, much of it showing most satisfactory results. Strawberries, currants, raspberries, gooseberries, and blueberries have been found to do well; cranberries not so well. Apple-growing is still in the experimental stage, cherries and plums have so far not proved a success. Potatos, cabbages, cauliflower, broccoli, Brussels sprouts, kale, kohlrabi, peas, broad beans, turnips, carrots, onions, chives, lettuce, celery, parsley, cress, corn salad, endive, and rhubarb all gave good results.—*M. L. H.*

Alyssum, Sweet. By S. Mottet (*Rev. Hort.* vol. lxxxviii. pp. 160, 161; 1 fig.)—*Alyssum maritimum compactum lilacinum* forms low-growing compact tufts, which are covered with lilac flowers for a period of two months. It is one of the most valuable of annuals.—*S. E. W.*

Anemone nemorosa, Variations in. By E. J. Salisbury (*Ann. Bot.* Oct. 1916, vol. xxx. no. cxx.; figs.).—Two varieties distinct from the common form are mentioned as being fairly numerous in some of the Hertfordshire woodlands, and for which the author has proposed the names *A. nemorosa* var. *robusta* and *A. nemorosa* var. *apetala.* The former differs from the normal type in the lighter green colour and larger size of the vegetative organs and in the perianth segments, which are broadest above the middle and rounded towards the apex. The latter bears inconspicuous flowers, which are small purplish-green structures, and it is noted that these plants are usually associated with the more deeply shaded situations, but as this character is maintained when the coppice in which the variety grows is felled, it is not considered a mere effect of inadequate illumination.—*G. D. L.*

Apple Aphis, Rosy. By A. C. Baker and W. F. Turner (*Jour. Agr. Res.* vii. pp. 321–343, Nov. 1917; plates).—The authors consider the proper name of this insect to be *Aphis malifoliae*, not *A. sorbi* as it is usually called. Other synonyms are *A. pyri* Koch, and *A. kochii* Theobald. The structure and life-history of the insect are dealt with at length. The eggs hatch (in Virginia) in the early half of April, and the first stem mothers begin to propagate about April 25. Five to seven generations occur on the apple (but in some cases the pest appears to be present all through summer). The first generation is wingless, and succeeding generations contain larger and larger percentages of winged forms. Migration to plantain (*Plantago lanceolata*) commences about May 20, and few remain on the apple after the end of June. There are from four to fourteen generations on the plantain. About the third week in September migration to the apple occurs and egg-laying thereon commences about the middle of October, continuing until the oviparous females are all dead, even into the latter part of December.—*F. J. C.*

Apple, Black Root-rot of the. By F. D. Fromme and H. E. Thomas (*Jour. Agr. Res.* x. pp. 163–173, July 1917; 3 plates, 1 figure).—The black root-rot of the apple is an infectious disease which has become very prevalent in Virginia, U.S.A. The chief symptoms are the formation of black incrustations on the surface of attacked roots, and it was found that the disease is infectious. Newly planted apple-trees on fresh land are very liable to this disease. The authors have isolated three species of *Xylaria* from affected roots. Of these, *Xylaria hypoxylon* proved to be the most deadly species. Since this species of fungus is commonly met with on stumps of forest trees, land which has been already under cultivation is more suitable for apple-growing than newly cleared land.—*A. B.*

Apple, Effects of Blackrot Fungus, Sphaeropsis malorum, on Chemical Composition of. By C. W. Culpepper, A. C. Foster, and J. S. Caldwell (*Jour. Agr. Res.* vii. pp. 17–40, Oct. 1916).—The variety 'Red Astrachan' was used in the experiment. The fungus caused considerable reduction in amount of total solids, and various changes occur in the products extractable with alcohol, etc., but there is no reduction of acidity by formation of purin and hexone bases as was found in attacks of *Glomerella rufomaculans*, though the acidity rapidly diminishes. Mineral matter is brought into solution, and sugars rapidly decrease. Starch is not attacked. The alcohol content is largely increased.—*F. J. C.*

Apple, Laying Out the Orchard. By J. Farrell (*Jour. Agr. Vict.* Sept. 1916, pp. 522–532).—Well-described and illustrated methods for setting out commercial orchards, by the use of a wooden frame to set off the right angles, and fencing wire of No. 8 or 10 gauge, with distances (say 20 feet apart) marked by a piece of finer wire soldered on to the wire, a loop being made at each end, about 5 feet from the end marks, into which two iron pegs or crowbars are placed to hold the wire, when fixed in position for marking off.—*C. H. H.*

Apple Stocks, Double-worked. By J. Farrell (*Jour. Agr. Vict.* Oct. 1916, p. 578).—In Victoria the stocks mostly used are 'Northern Spy' and 'Winter Majetin,' as they resist the attack of woolly aphis. A double-worked blight-proof stock consists of two portions of the blight-resistant variety intended for use. A piece of root is employed as a "starter," on which is grafted a scion, or portion of yearling wood, which produces the shoot on which the desired variety may be either budded or grafted. Double-worked 'Northern Spy' root grafts are the stocks recommended, as they are most favoured by the fruit-growers in Victoria. A piece (A) of 'Northern Spy' root 2½ inches long is cut with a grafting knife and tongued; a piece (B) of yearling wood of the same variety 4 inches long is cut and tongued. The root and scion are then placed together and the tongues put into each other to make a firm graft, and tied with a piece of soft string. The root graft is planted during early spring, the top bud of the scion is allowed to project above the soil level. The sap commences to move in the starter, fibrous roots are thrown out, and cambium connexion formed between stock and scion; fibrous roots are also thrown out at the buds under the soil in the stock, and from these the future root system of the tree is mainly formed. The shoot is budded with the desired variety, or should this miss the stock is cut and top-grafted about 9 inches from the ground.—*C. H. H.*

Apple Tree Tent Caterpillar, The. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 662; May 1915; 7 figs.).—This species is subject to attack by numerous parasitic and predaceous insects. The caterpillars are also subject to destruction by a bacterial disease, especially when nearly full-grown.
V. G. J.

Apple Trees, A Blossom Wilt and Canker of. By H. Wormald, M.Sc., A.R.C.Sc. (*Ann. Appl. Biol.* iii. April 1917, pp. 159–204; 8 figs.).—Great loss is caused to fruit-growers in the S.E. of England by a "Blossom Wilt and Canker of Apple Trees." The open flowers are the seat of infection, as the fungus attacks the tissues of the flowering spur, destroying the leaves and inflorescence, sometimes infecting the branch and cankering it. Pustules of conidia are produced in the winter and spring following from the dead spurs, and the falling conidia cause a new outbreak through infecting the opening flowers. Infection does not appear to take place through wounds.

The disease may be checked by cutting out all dead spurs and cankers before the blossoms open. To be effective, the brown and dead wood and bark must be removed thoroughly.

Spraying must be done before the flower buds open, and must be capable of destroying the powdery conidial stage, or at least of preventing the conidia from falling during the time when the blossom is open and receptive. Lime-sulphur wash has not given favourable results. Bordeaux mixture, on account of its slightly better adhesive properties, gave a little better result. Ammonium sulphide solution (see *Jour. Agr. Sci.* vii. pp. 473–507) and soft soap, applied as late as possible before the flowers opened, killed the surface layers of the pustules. The temporary prevention of the fall of conidia in this way during the critical period of infection offers the most promising field for further experiment.

The causal organism is a grey *Monilia,* included under *Monilia cinerea* Bon, distinguishable from *M. fructigena.*—*R. C. S. R.*

Aquilegia, A New Hybrid. By T. D. A. Cockerell (*Bot. Gaz.* Nov. 1916, pp. 413).—The cross was made between *Aquilegia chrysantha* Gray (a garden strain) with *A. desertorum* (Jones) Cockerell, from Santa Fé Canyon, New Mexico.

The following is a description of a typical flower:—

Flower nodding. Sepals about 19 mm. long and 8 mm. broad, pink, with a faintly purplish shade, or the apex distinctly purplish. Petals 30 mm. long (to end of spur), 8 mm. wide near apex, broadly truncate and sub-marginate apically; apical 10 mm. cream colour, spur rose-pink; spur broader basally than in *A. desertorum.*

We may give it a simple Mendelian interpretation by saying that the dominant characters are the spur-length of *A. desertorum* and the flower width of *A. chrysantha.*—*R. J. L.*

Arsenate of Lime as an Insecticide. By W. M. Scott (*Jour. Econ. Entom.* viii. p. 194; April 1915).—Arsenate of lime would be considerably cheaper than lead arsenate, and could be made at home. The author and others report insecticidal results following its use equal to those obtained by the use of lead arsenate, generally with safety to the foliage, though occasional burning resulted. The material certainly merits trial against the lead arsenate, and can be made by adding sodium arsenate to slaking lime, decanting the liquid which contains caustic soda in solution before mixing with Bordeaux mixture, lime-sulphur, or water (2 lb. to 50 gallons) for use.—*F. J. C.*

Arsenates, Toxic Values and Killing Efficiency of the. By A. L. Lovett and R. H. Robinson (*Jour. Agr. Res.* x. pp. 199–207; July 1917).—This paper deals with the results obtained in a study of the relative toxic value of pure samples of lead hydrogen arsenate, basic lead arsenate, and calcium arsenate in poison sprays as insecticides.

It was found that lead hydrogen arsenate has a higher killing efficiency (upon caterpillars), at a given dilution, than either calcium or basic lead arsenate. A longer time is required to kill mature caterpillars than the small forms. All the arsenic devoured by the insects in feeding upon sprayed foliage is not assimilated, but a portion is excreted. This amount varies with the arsenate used; lead hydrogen arsenate was assimilated readily and most of the arsenic was retained in the tissue, but in the case of basic lead arsenate the greater amount was excreted. It was found that about 0·1595 milligram of arsenic pentoxide is required to kill 1000 small tent caterpillars, and about 1·84 gram of arsenic pentoxide to kill 1000 mature tent caterpillars, irrespective of the particular arsenate used as a spray.

Calcium arsenate is not suitable as a spray, because of its burning effects upon the foliage.—*A. B.*

Artichoke, Jerusalem (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. p. 115, Aug. 1916).—This vegetable might profitably be much more extensively grown. It flourishes

in poor soil, can resist great cold, requires very little attention, and is both nourishing and generally relished. This list of good qualities seems to mark it out as a suitable war-time crop.—*M. L. H.*

Assimilation of Iron by Rice in Nutrient Solutions. By P. L. Gile and J. O. Carrero (*U.S.A. Jour. of Agr. Res.* vol. vii. No. 12, Dec. 1916, pp. 503–528).—Rice was grown in acid, neutral, and alkaline solutions with different quantities of iron to determine if rice was sensitive to the reaction of the substance, and if this reaction influenced the assimilation of iron.

In nearly all cases growth was much better in the nutrient solutions containing ·008 grm. of iron per litre than in solution containing ·002 grm. per litre. $FeSO_4$, ferric citrate, and ferric tartrate afforded sufficient iron when used in acid and alkaline solutions for the growth of the plants.

Plants grown in the acid solutions contained the highest percentages of iron; those in neutral solutions contained higher percentages of iron than those in alkaline solutions, but the percentages of nitrogen, phosphoric acid, lime, magnesia, and carbon-free ash in plants did not vary appreciably in six different solutions.

The amount of available iron could not be determined analytically because of the impossibility of distinguishing between colloid and soluble iron. Calculations, however, showed that the concentration of available iron in many cases must have been less than one part in 10,000,000 of solution.

A short bibliography is appended.—*A. B.*

Astilbe Tacqueti. By S. Mottet (*Rev. Hort.* vol. lxxxviii. pp. 188–189; 1 plate).—*Astilbe Tacqueti* was raised from seed collected in east China. It is a hardy and vigorous plant about thirty inches high. About the beginning of July it bears numerous small flowers of a lilac hue in panicles.—*S. E. W.*

Beech Disease caused by Bulgaria polymorpha. By R. J. Tabor and K. Barratt (*Ann. Appl. Biol.* iv. p. 20; Sept. 1917).—The symptoms of the attack upon the beech are the exudation of a brown gummy liquid from various points in the bark, the bark is killed, and the life of the tree threatened; the living diseased trees are rendered unsightly by the gum. The parasitism of the organism was investigated, and the indications point to it being a bark parasite, but healthy young trees resisted infection.—*F. J. C.*

Bees, Isle of Wight Disease (Nosema apis), **Recommendations to Reduce this Disease.** By F. R. Beuhne (*Jour. Agr. Vict.* Oct. 1917).—(1) Not to locate hives in shady places. (2) To keep the ground around the hives bare and clean. (3) To keep water from penetrating the hives during winter. (4) To re-queen all colonies which, from no visible cause, lag behind the average, and are therefore possibly disease carriers. (5) To use for re-queening only queens from stocks which, by their yields of honey, due to the longevity of the workers, have proved their resistance to disease.—*C. H. H.*

Berberis levis. By Dublin (*Irish Gard.* xii. p. 20).—A desirable robust Chinese shrub growing to the height of six feet or more. Produces yellow flowers in clusters in the spring.—*E. T. E.*

Black Currant Eelworm. By Miss A. M. Taylor (*Jour. Agr. Sci.* vol. viii. 2, pp. 246–275; 1 fig., 1 pl.).—This ecto-parasite, a member of the group Anguillulidae, has hitherto escaped attention, owing to the fact of its close association with the black currant mite with which it lives in unison. It has recently caused much damage in plantations near Cambridge. The symptoms produced by the two parasites are very similar in certain respects, and the nematode is responsible for at least an equal share of the damage hitherto attributed wholly to the mite. Both attack the bud; in the life-history of both there is a period when a nomadic existence is led, while the buds are in a rudimentary condition, followed by a longer period spent in the developing and mature buds. Both gain entrance to the buds between the scale leaves; both reproduce throughout the year. On the other hand, the nematode does not produce "big-bud." Also bud leaves attacked by the worm show isolated discoloured areas, which are moist and transparent, and these appearances may occur throughout the year, whereas the discoloured tissue due to the mite is opaque, and is usually noted only in the fall of the year. Further, the mites migrate from the buds definitely in the spring (there may be, however, individual migration in the summer and autumn). The nematodes, on the other hand, are driven to migrate at frequent intervals as soon as the buds which they have attacked die.

The diameter of the nematode does not at the most exceed half that of the mite. Hence it has no difficulty in entering the bud. They are gregarious,

reproduce throughout the year, and owing to their extreme lethargy may easily be overlooked when sought for by the aid of a magnifying glass. When very numerous in the bud and about to migrate, they have the appearance of fragments of cotton-wool at the bases of the bud leaves, which fragments are visible to the naked eye. Examination with a lens shows that these white fluffs are colonies of worms in compacted masses. Placed in water the fluffy fragments disintegrate, and the separated nematodes wriggle actively. Migration from bud to bud occurs only if the requisite degree of moisture—rain mist, or heavy dew—is present. Destruction of attacked buds is rapid, especially in the spring, when the buds are minute : the consequent efforts of the tree to produce new wood result in an irregular growth, which with the accompaniment of dead shoots and shrivelled bark is typical of the presence of the eelworm. The worms do not invade the buds if the stems are kept dry, but they can, on the other hand, penetrate the soil and infect the moist basal buds below the surface. Attempts were made to ascertain whether the red currant and gooseberry could be infected by the eelworm. It was found that after inoculation the worms were present in the buds in limited numbers, but that on the whole the buds were normally developed. These plants, it is therefore concluded, are uncongenial hosts of the nematode.

It having been suggested to the author that the parasite might be identical with *Aphelenchus fragariae*, which causes the rather rare disease known as Cauliflower Disease of the Strawberry, attempts were made both in the greenhouse laboratory and in the field to infect strawberry plants with the nematode. The results were on similar lines to those in the case of gooseberries and red currants, *i.e.* some infection took place under greenhouse conditions, but the development of the strawberry plants was unaffected. In the field where the choice of hosts was between black currant and strawberry, the latter was always free from the worm.

The Anguillulidae, under unfavourable food conditions, may become desiccated, and in this condition may remain in a state of suspended vitality for months or years. A similar state is induced if twigs of black currant infected with the black currant eelworm are kept dry. After nine months' desiccation, followed by immersion in water, very few of the nematodes are found to be alive. Shorter periods of desiccation—six weeks up to six months—appear not greatly to affect the worms, which on moistening for one to two hours are found to have returned to the normally active state. As so lengthy a dry period as nine months does not occur in the case of black currant bushes, it is clear that under field conditions the mortality among the nematodes due to this cause is negligible.

Full details of the morphology of the nematode are given, illustrated by a plate of ten figures. It is provisionally assigned to the genus *Tylenchus* with the specific name *ribes*.—*J. E. W. E. H.*

Black-Rot, Leaf-Spot, and Canker of Pomaceous Fruits. By L. R. Hesler (*U.S.A. Exp. Stn., Cornell, Bull.* 379, August 1916, pp. 50–148; 20 figs., 8 plates).—This is primarily a disease of the Apple (*Pyrus Malus* L.), but it affects other trees, such as the Pear (*P. communis* L.), the Quince (*Cydonia vulgaris* Pers.), and the Crab Apple (*P. coronaria* L.) showing similar symptoms of the disease.

The causal organism is *Physalospora Cydoniae* Arnaud and it reproduces by ascospores contained in perithecia, as well as by pycnidia and sclerotia.

Certain varieties of apple—'Esopus' and 'Twenty Ounce'—are more susceptible to canker than are other varieties, but 'Twenty Ounce' is one of the best varieties in New York.

It is interesting to note that a fungus *Helicomyces Sphaeropsidis* Potebnia, has been found living as a parasite upon the conidia of *Physalospora Cydoniae*, and that infection takes place when the host fungus is in the macrophoma stage.

A very full bibliography is appended.—*A. B.*

Bones: How to make into Manure (*Queensland Agr. Jour.* p. 291; Nov. 1916).—Bones, which when properly treated form a valuable fertilizer, may be readily reduced to powder without the aid of a crushing mill. A simple plan is to pack the bones, layer by layer, with fresh wood ashes in a barrel, and keep the mixture moistened for some months. A quicker method is to boil the bones in an iron or copper boiler with strong caustic lye. The proportion of bones and lye to be used is, roughly, 15 parts by weight of bones to 5 of caustic soda, or 7 parts by weight of caustic potash dissolved in 15 parts by weight of water. The boiling should be done for two or three hours. But even without boiling, the bones will become disintegrated by being simply kept in the caustic liquor for about a week. Another method of softening bones is by mixing them in heaps with

quicklime and loam. A layer of loam 4 inches deep is first spread, and on this is placed a layer of bones 6 inches deep, and above this a layer of quicklime 3 inches deep. The layers of loam, bones, and quicklime are repeated till the heap reaches a convenient height, when it is covered all over with a thick layer of earth. Holes are then bored in the heap from the top, and water poured down them to slake the lime. This mass will become hot, and remain so for two or three months, after which the bones will become friable, and the whole heap may then be mixed up and spread as manure on the land.—*C. H. H.*

Bordeaux Mixture, The Influence of, on the Rates of Transpiration from Abscissed Leaves and from Potted Plants. By W. H. Martin (*U.S.A. Jour. Agr. Res.* vol. vii. No. 12, Dec. 1916, pp. 529–547).—The results of these experiments confirm the statement that the rates of transpiration from abscissed leaves and from potted plants are materially increased by an application of Bordeaux mixture. A surface covering of dry powdered $CuSO_4$ was less effective in accelerating rates of transpiration than a surface film of Bordeaux mixture, but was more effective than a film of $BaSO_4$.

The effect was greater in the case of abscissed leaves than in the case of leaves of potted plants.

The increased rate was immediately observed after the spray had dried upon the leaves; the highest rate occurring during the first two hours after spraying.
A. B.

Brown Spot on 'Emperor' Mandarin. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 190–196).—To exterminate Brown Spot (*Colletotrichum gloeosporioides*) on 'Emperor' Mandarins, prune away diseased and dead wood, and spray with Bordeaux mixture composed of 6 lb. of copper sulphate, 4 lb. of lime, and 50 gallons of water. When the disease has been got under control, a spray of half the strength may be used. Bordeaux is more efficient than formalin, copper sulphate, or potassium sulphide.—*S. E. W.*

Buddleia asiatica. By A. O. (*Irish Gard.* xii. p. 36).—An attractive plant for clothing bare pillars in large conservatories. Flowers not large but freely produced, and plants easily propagated by cuttings in March. First introduced from India 1874, but more recently from China by E. H. Wilson.
E. T. E.

Cabbage and Allied Crops in Connecticut, Insects Attacking. By W. S. Button and Q. S. Lowry (*U.S.A. Exp. Stn., Conn., Bull.* 190; January 1916; 17 figs.).—Many of the insects described are of European origin. For all the leaf-eating insects the authors recommend spraying or dusting the plants with arsenate of lead, which is perfectly safe before the plants are headed. When nearly ready to harvest, it is advisable to dust the plants with Pyrethrum or some other fine dust, applied with a blower or powder gun. With regard to the cabbage-root maggot (*Phorbia brassicae* Bouché), the best remedy is to place discs of tarred paper round each plant as soon as it is set out. These discs lie flat on the ground and prevent the female fly laying eggs on or near the stem just below the soil surface. The second most effective method of control is to pour into a surface depression around the stem of each plant about three ounces of crude carbolic acid emulsion made to the following formula:—

Hard soap, 1 lb.; or soft soap, 1 quart.
Boiling water, 1 gallon.
Crude carbolic acid, 1 pint.

Dissolve the soap in the boiling water, add the acid, and mix well. This mixture thickens on cooling, and should be diluted with thirty times its bulk of water before using.—*V. G. J.*

Cabbage Butterflies. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917; pp. 4–5).—Ravages of larvæ of cabbage white butterflies in S. Wales 1914, among garden crucifers and swedes. Broccoli and sprouts were chiefly damaged on the sunnier slopes, the upper parts of fields and similar hot, dry situations, while gardens and fields in damp situations, near rivers &c., were least affected.

Farmers reported broadcasting lime and soot were without avail, but Keating's powder (Pyrethrum) had given excellent results upon cabbage. Commencing on September 28 several rows were treated with soot dustings, brine waterings, and dustings with Pyrethrum, respectively. The first two gave little benefit, but the last was rapidly effective in eradicating the pest.—*R. C. S. R.*

Cabbage Maggot, Biology and Control of the. By W. J. Schoene (*U.S.A. Exp. Stn., New York, Bull.* 419, March 1916, pp. 99–160; 8 plates, 3 figs.).—For more than eighty years the cabbage maggot (*Phorbia brassicae* Bouché) has been regarded as the most important injurious pest of cruciferous vegetables, such as cabbage, radish, cauliflower, and turnip. The damage it causes fluctuates from year to year. Like its host, it attains maximum development in a cool, moist climate. A full description of the various life stages of the insect is given. The egg is deposited on or near the plants, and three to five days later the larva appears and attacks the root or part of the plant devoid of chlorophyll. The larva matures in eighteen to twenty days, and then enters the soil to pupate. The pupal stage may last from twelve to eighteen days or may be prolonged for several months (the insect hibernating). The females begin to oviposit soon after emerging, probably within three to five days. Adults may live for five or six weeks. With favourable conditions, there are three broods and perhaps a partial fourth. For the maggot to occur in great numbers, the presence both in spring and autumn of large acreages of succulent cruciferous roots is necessary. As regards treatment, the use of cheesecloth screens proved very satisfactory in securing cabbage seedlings free from injury, provided that the coverings were fly-proof. Tar-paper discs also proved effective, but in the open field the sticky surface soon became covered with dust and ceased to be of use. The removal of all crop remnants and the destruction of cruciferous weeds will lessen the numbers of the insect.—*F. G. A.*

Calcium and Magnesium Compounds, their Influence on Plant Growth. By F. A. Wyatt (*Jour. Agr. Res.* vi. pp. 589–620; July 1916; plates).—The author refutes the magnesium-calcium-ratio theory of plant growth, but shows that certain magnesium salts added to soils may produce the condition known as magnesium sickness characterized by the yellowing of the uppermost leaves of plants, the lower remaining green.—*F. J. C.*

Calcium Cyanamide as a Manure, Some Conditions affecting the Value of. By T. D. Mosscrop (*Jour. Agr. Sci.* viii. pt. 2, pp. 178–181; March 1917).—An important drawback in the use of calcium cyanamide as a manure is its injurious effect upon germinating seed when it is first applied to the soil. Seeds of cos lettuce, turnip, and barley were germinated on porous tiles under bell-jars water-sealed from the outer air. Inside the bell-jars was placed calcium cyanamide mixed with water, with soil water, and with moist earth. The lettuce seeds did not germinate, and microscopic examination showed a blackening of the cotyledons within the testa. With 1 gram only of calcic cyanamide within the jar the germination of the turnip and barley seeds was not greatly affected, but with as much as 4 grams marked inhibition was observed. The blackening action is by the condition of the experiment due to some volatile decomposition product of nitrolim, and further experiments showed that the action is not due to cyanamide, nor to dicyanamide, nor to cyanamide carbonate, but simply to ammonia, which with carbon dioxide and acetylene (a trace) is the gaseous product resulting from the action of water on nitrolim. Pot experiments showed that the injurious action had ceased eight days after application of the nitrolim to the soil. Oily seeds are affected little or not at all.—*J. E. W. E. H.*

Calcium Phosphates, The Solubility of, in Citric Acid. By A. A. Ramsay (*Jour. Agr. Sci.* viii. June 1917).—It is generally held that these phosphates exist in the state of mono-calcic phosphate soluble in water, di-calcic phosphate or reverted phosphate soluble in citric acid, and tri-calcic phosphate soluble in neither water nor in citric acid. The author was unable to purchase the pure tri-calcic compound: the calcic phosphate of the British Pharmacopœia was found to be a mixture of the tri- and di- compounds; di-sodic phosphate added to ammoniacal calcic chloride does not give it, but a mixture of the di- and tri- compounds, together with calcic hydrate and a similar mixture, is given by bone ash dissolved in hydrochloric acid and precipitated by ammonia. The author finds that pure tri-calcic phosphate is obtained by acting on one equivalent of pure pentoxide of phosphorus with three equivalents of calcic oxide. If, however, only two equivalents of calcic oxide are added, the product is not the di-calcic salt but a mixture of di- and tri-calcic phosphates. The pure tri-calcic compound is found to be completely dissolved by four separate thirty-minute extractions with 2 per cent. citric acid solution, but the separate extracts do not contain phosphoric acid and lime in the proportions required by the formula for tri-calcic phosphate. The citric acid in fact is more correctly a solvent for lime than for phosphoric acid, as is shown by the fact that by the simple addition of calcic carbonate to the tri-calcic phosphate the solubility of the latter in citric

acid is decreased by several per cents. From the preceding facts it seems clear that the manurial value of a phosphate cannot be determined by a 2 per cent. citric acid solvent in the manner prescribed, and that further investigations are necessary.—*J. E. W. E. H.*

Callitris oblonga. By A. B. Jackson (*Gard. Chron.* July 7, 1917, p. 3; with fig. p. 7).—A rare species peculiar to Tasmania. The plant 8 feet high at Rostrevor, planted in 1893, appears to be the only specimen in Ireland, although it seeds freely.—*E. A. B.*

Carbohydrates, The Estimation of. V. By W. A. Davis (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—Contrary to the view almost universally held, basic lead acetate does not precipitate laevulose from solution. If it be added in excess to a solution of pure laevulose and at once precipitated, practically 100 per cent. of the sugar is recovered. If left for varying periods of time, an increasing amount of laevulose disappears and Lobry de Bruyn's glutose is found in increasing quantities. The conversion is accelerated by heat. On the other hand, digestion of maltose or dextrose with basic lead acetate leads to no loss of these sugars—an important distinction from the practical standpoint.

J. E. W. E. H.

Celery-Rot Bacillus, The. By H. Wormald (*Jour. Agr. Sci.* viii. pp. 216–245, March 1917; 2 plates).—The celery plant is susceptible to a bacterial attack, producing in the affected tissue a brown soft rot, which may be so pronounced that a high percentage of the plants may, on lifting, prove to be quite useless. Infection is brought about through a puncture or on a raw surface: the organism appears to be unable to attack uninjured living organs, nor does it produce infection through water pores. The organism will also produce a soft rot in radish, carrot, potato, artichoke, turnip, and swede. Earthing up renders celery plants less resistant: wrapping the plants in paper tends to protect them from the gnawing of snails and slugs, and therefore indirectly from infection.

Details are given of the action of many antiseptics of various strengths. A 0·1 per cent. solution of copper sulphate and a 0·01 per cent. solution of formaldehyde proved to be effective germicides.

The organism is yellowish, sensitive to desiccation, typically bacilliform, but under certain conditions may either be coccus-like or develop long filaments, and can grow in a synthetic medium containing either sugar or pectin as the sole carbon compound. It is possibly a variety of *B. carotovorus*, and the author has named it *B. apiovorus*.

A bibliography at the end of the paper gives 47 references.—*J. E. W. E. H.*

Chafer Beetles. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917, p. 8).—The garden chafer, *Phyllopertha horticola*, is locally exceedingly abundant at times in the Aberystwyth area. An inhabitant of the "slope land," it swarms about the sunny sides of the mountain valleys, the adults in June, the larvæ in August–September. Rooks render great service in devouring the pest, and this chafer is largely controlled by these birds.

R. C. S. R.

Cherry By-Products, The Utilization of. By Frank Rabak (*U.S.A. Dep. Agr., Bull.* 350, Washington, March 1915).—Fruit-packing as an industry has been enormously developed of late years in the United States.

Fifteen thousand tons of the sour red cherry alone are annually exported from Californian orchards. The fruit is stoned before packing, and hitherto the stones and a great quantity of juice are not only wasted, but are a source of expense in carting away. Chemically, the stones contain the same constituents as peach and almond stones in varying quantities, and experiments show that both fixed and volatile oil can be extracted from them. The resulting mass by analysis might be a useful feed for stock. This bulletin contains a description of the methods of extraction used, and suggests ways of making use also of the surplus juice.—*M. L. H.*

Chicory, Witloof, Culture and Forcing of. By J. W. Wellington (*U.S.A. Exp. Stn., New York, Bull.* 418, March 1916, pp. 89–98; 3 plates).—The author suggests that Witloof Chicory, of which large quantities were imported from Belgium and France previous to the war, should be grown and forced by American gardeners. It is an improved variety of the common Chicory, *Cichorium Intybus* Linn., a native of Europe, but now found naturalized in many parts of America, and often a pernicious weed. It is easily grown from seed. The size of head when forced was found to be in accordance with the size of root

used. Roots having a crown diameter of from one to two inches produced the greatest number of marketable heads. Sand proved a very satisfactory covering for the roots; it blanched the leaves perfectly and promoted the formation of compact heads. A steady temperature of about 60° F. appeared to be the best; lower degrees were found satisfactory but required more time to mature the crop. It is necessary to keep the soil moist. The time required for forcing the crop was fifteen days.—*F. G. A.*

Chinese Plants, New. *Arbores Fruticesque Chinenses*, Novi, I. By Camillo Schneider (*Bot. Gaz.* vol. lxiii., No. 5, May 1917, pp. 398–405).—Detailed botanical descriptions are given of the following new species and varieties:—

(1) *Deutzia* (Sect. Eudeutzia, subsect. Stenosepalae Schn.) ***Rehderiana***, sp. n.
(2) *Spiraea* (Sect. Chamaedryon Ser.) ***teretiuscula***, sp. n.
(3) *Malus pumila* Mill, var. ***subsessilis***, n. var.
(4) *M.* (Sect. Docyniopsis Schn.) ***docynioides***, sp. n.
(5) *Sorbus* (Sect. Aria) ***Ambrozyana***, sp. n.
(6) *S. hupehensis* Schn. var. ***aperta***, n. var.
(7) *S. hupehensis* var. ***obtusa***, n. var.
(8) *S. hupehensis* var. ***laxiflora***, n. var.
(9) *S. Prattii* Koch. var. ***tatsienensis***, n. var.—*R. J. L.*

Chinese Plants, New. *Arbores Fruticesque Chinenses*, Novi, II. By Camillo Schneider (*Bot. Gaz.* vol. lxiii. No. 6, June 1917, pp. 516–523).—Further descriptions of the following new plants are given:—

(1) *Clematis chrysocoma* Fr. var. ***sericea***, n. comb.
(2) *C. Delavayi* Fr. var. ***calvescens***, n. var.
(3) *C. urophylla* Fr. var. ***obtusiuscula***, n. var.
(4) *C.* (Sect. Viorna Prtl., ser. Connatae Koch.) ***Kochiana***, n. sp.
(5) ***Mahonia Alexandri***, n. sp.
(6) *M.* ***caesia***, n. sp.
(7) *M.* ***philippinensis***, n. sp.
(8) *M.* ***nivea***, n. sp.
(9) *Schizandra grandiflora* var. ***cathayensis***, n. var.
(10) *S. grandiflora* var. ***rubriflora***, n. comb.—*R. J. L.*

Citrus Disease, A New Bacterial. By H. A. Lee (*Jour. Agr. Res.* ix. April 1917, pp. 1–8; 3 plates).—A new disease of Citrus trees, endemic to Northern and Southern California, shows black discoloured areas on the leaves near the junction of the leaf blade and the petiole, and causes the leaves to fall prematurely. The disease frequently spreads to the twigs and causes them to become shrivelled and black. The symptoms resemble frost injury, but it has been found that it is caused by a bacterial organism (*Bacterium citrarefaciens*), apparently a new species.

The bacterium exists in the parenchyma and destroys cell structure, forming large pockets filled with bacterial masses. The germ does not enter the vascular bundles. Cultures on artificial media show the bacterium can liquefy gelatine and forms white smooth glistening colonies on agar. The bacterium is 1·8 by ·6 μ and is flagellate, readily stained with aqueous fuchsin, carbol fuchsin, and gentian violet, is Gram negative and not acid fast.—*A. B.*

Citrus Thrips, Control of the. By J. R. Horton (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 674; July 1915; 7 figs.).—Of the large number of combinations of insecticides tested, the following have given the best results:—

1. Commercial lime-sulphur.
2. Sulphur-soda solution.
3. Commercial lime-sulphur and black tobacco extract (40 per cent. nicotine sulphate).
4. Black-leaf tobacco extract (40 per cent. nicotine sulphate, 1 part to 800 parts water).—*V. G. J.*

Clematis Stem-rot and Leaf-spot caused by Ascochyta clematidina. By W. O. Gloyer (*Jour. Agr. Res.* iv. pp. 331–342, July 1715; plates).—The die-back disease of Clematis, well known in England, has been investigated by the author, who found *Ascochyta clematidina* always associated with it. The disease affects various hybrids and species differently. The hybrids grown outdoors are affected by stem-rot, while in the greenhouse, "where the cuttings are propagated," they are attacked by a leaf-spot as well. *Clematis paniculata* shows both forms of rot. The fungus was isolated in pure culture, and reproduced the disease when inoculated into the stems of *C. Jackmanni* and *C. paniculata*, and

also when the spores were sprayed upon healthy plants of the latter. Spraying (except of the young plants in the frames, where the advantage of the use of Bordeaux mixture was marked) proved of little benefit, but the removal of dead leaves and " stubs " is recommended, as well as the provision of ample means of climbing.—*F. J. C.*

Coccidae affecting various Genera of Plants. By E. E. Green (*Ann. Appl. Biol.* iv. p. 75, Sept. 1917).—A useful list extending to 14 pp. and only dealing with genera, which are arranged alphabetically, from A to C, is given. Economic entomologists will find this list of the greatest assistance in getting at the name of scale insects which come under their notice, and as an indication of what is known concerning the attacks of different scale insects upon plants.—*F. J. C.*

Coccidae of Australia (continued). By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 809–816, 883–888 ; vol. xxviii. pp. 135–140 ; 8 figs.)—The continuation of the list of Australian scale insects includes : *Pseudoripersia turgipes, Erium globosum, Dactylopius acaciae, D. affinis, D. albizziae, D. auriliantus, D. australiensis, D. bromeliae, D. ericicola, D. grevilleae, D. herbicola, D. hibbertiae, D. lanigerus, D. lobulatus, D. longispinus, D. macrozamiae, D. similans, D. zamiae, Pseudococcus casuarinae, P. nivalis, Epicoccus acaciae, Lachnodius eucalypti, L. hirtus, L. lectularius, Rupersia leptospermi,* and *Antonina australis.*

The following new species were observed : *Erium frenellae,* found on the foliage of the desert cypress (*Frenella robusta*) in New South Wales. The adult female is enclosed in an elongated white sac. She is broadly oval, of a yellowish brown colour, with short legs, and seven-jointed antennae. The epidermis is covered with rod-like processes and small round orifices. *E. newmani,* from Darlington, West Australia, resembles *E. globosum,* but is larger. *Dactylopius candidus,* found on *Acacia decurrens* near Sydney, resembles *D. acaciae,* but differs from it in the structure of the antennae, which are eight-jointed, and in its very small anal tubercles.

D. hilli lives on the leaves of a wattle at Darwin in the Northern Territory. The adult female is pale brownish yellow with mealy secretions fringed with woolly filaments. It is broadly oval and has eight-jointed antennae. *Pseudococcus stolatus* thickly covers the bark of *Mypopium deserti* with their oval white sacs. The adult-female is light brown, felted, ribbed with transverse lines, the margin fringed with short woolly filaments and has antennae with joints.—*S. E. W.*

Codling Moth, Late Broods of the. By B. S. Pickett (*U.S.A. Exp. Stn., Ill.*; June 1914 ; *Circ.* 171 ; 7 figs.).—The object of this circular is to call special attention to the urgent need for strenuous efforts to combat this insect during the late summer season. Two means of control are recommended, spraying frequently and thoroughly with arsenate of lead, and trapping the worms in bands on the trunks of the trees.—*V. G. J.*

Colorado Beetle, Control of the, Second Report. By L. B. Smith (*U.S.A. Dep. Agr., Virginia Truck Exp. Stn., Bull.* 17 ; Oct. 1915 ; 2 tables).—The experiments during the season of 1915 verify the more important points of the work done the previous season. Home-made Bordeaux mixture 50 gals., arsenate of lead 4 lb., and Paris green 1 lb., continue to give excellent results. Arsenate of lead paste at the rate of 2 lb. to 50 gals. Bordeaux proved very efficient in the destruction of the beetles. Calcium arsenate was tried, and the results indicate that it may prove of great value.—*V. G. J.*

Cone Beetles : Injury to Sugar Pine and Western Yellow Pine. By John M. Miller (*U.S.A. Dep. Agr., Bull.* 243, July 24, 1915).—The greater part of the damage to these pines is caused by small scolytid beetles, *Conophorus* spp. The common name of " cone beetles " seems most appropriate for these insects, as their life history and the damage caused by them relate entirely to the cones of the host trees.

Sugar-pine cones at the beginning of the second-year growth are about 2 to 2½ inches long and are attached to the limb by a stalk from 2 to 3 inches long. The parent adult beetle attacks the cone by boring into the stalk of the cone. The position of this initial entrance varies greatly ; usually it is just above the base of the cone, but it may occur anywhere from the base of the cone to an inch or more above. The wound made by the beetle soon produces a flow of resin which gradually accumulates on the surface in the form of a small pitch tube. After boring into the centre of the stalk the beetle turns towards the cone and continues to extend its tunnel straight outward through the axis of the

cone. After it advances well into the heart of the cone the tunnel becomes the egg-gallery, and single eggs are deposited at intervals in notches excavated along the sides of the burrow. The entire length of the egg-gallery is packed with sawdust. Sawdust is also packed around the eggs in the egg notches.—*A. D. W.*

Corsican Pine at Lochnaw. By Sir Andrew N. Agnew (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 83–84; July 1916).—There is no tree which has come into general use in Wigtownshire during the last half-century which has proved so serviceable as the Corsican pine. At least that has been the experience on the Lochnaw estate, where it has been planted regularly for forty years. It is an extremely hardy tree, growing and thriving in the poorest soils and in the most exposed situations. The Corsican pine has the reputation of being difficult to establish, but it has given no trouble there. It is rather slow in taking hold of the ground, and is consequently apt to get a shake in stormy weather during its first year or two. But once this stage has been got over, it is the most reliable tree we have, making the best of any circumstances, and standing erect and unshaken in the teeth of the fiercest gales.

The first Corsican pine planted at Lochnaw was in the year 1853. It is now a well-grown tree, 62 feet in height, with a gently tapering stem measuring 5 feet 3 inches at 5 feet above the ground.

The two things that catch the eye at once in a grove of the *P. Laricio* are the upright figure of the trees and the cylindrical shape of the stems. These two characteristics seem to mark out the tree as being specially adapted for pit-wood. There has been a great demand for home-grown timber for pit purposes since the war began, and to a lesser degree the demand is likely to be a permanent one.—*A. D. W.*

Corylopsis Willmottiae. By A. O. (*Irish Gard.* xii. p. 37).—A fairly common plant in Western Szechwan, introduced from China by E. H. Wilson. A bushy deciduous shrub which should be planted on a warm south-west or west border. The soil should be light loam, leaf-mould, and peat. Propagate by layering in the summer.—*E. T. E.*

Creosoting, The Rüping System of. By W. P. Greenfield (*Quart. Jour. of Forestry*, x. pp. 29–36; January 1916).—On most well-managed estates of any size there is some method in vogue for preserving and extending the life of the timber used in estate buildings and for fencing and other purposes. Several methods have been tried for this end, such as impregnating with naphthalene, or painting with solignum &c., but the most common process is that of creosoting with heavy creosote oil. There are three different processes of creosoting—(1) by pressure—the most effective; (2) by immersing the timber in creosote and boiling for some hours; (3) by simple cold immersion.

The second method is most commonly in use on estates, because the initial expense of the boiler and tank is much less than that of the apparatus required to creosote by pressure. It affords very good results with certain species of timber, but in others there is not the same thorough saturation of the outer tissues as with creosoting under pressure.

Formerly ordinary oak and larch fence posts would be rotten in about seven to eight years, but, by creosoting under pressure, inferior timber such as spruce can be used instead of good oak, which can be sold. The author has seen spruce fence posts thus creosoted that have stood in the soil for fifteen years, and when dug up the edges of the part that had been in the ground were still sharp, and even the saw kerfs could be seen. Plain spruce would have been rotten in a very few years.—*A. D. W.*

Crown-gall, Mechanism of Tumour Growth in. By Erwin F. Smith (*Jour. Agr. Res.* viii. Jan. 1917, pp. 165–186; 61 plates).—The ultimate cause of all proliferation in crown-gall is the micro-organism, *Bacterium tumefaciens* Sm. and T., but the mere mechanical irritation due to the introduction of a few rod-shaped bacteria in the tissues cannot be the direct cause of the proliferation, since other species of bacteria either have no specific action when inoculated into plants, or some quite different action, such as the wilting of the foliage due to the multiplication of bacteria into the vascular bundles (e.g. *B. tracheiphilus*), or a soft rot of the shoots and tubers (e.g. *B. phytophthorus*). In each of these types of plant disease (tumour, wilt, or soft rot) the ultimate cause is a bacterial infection, but the immediate or proximate cause must be the chemical or physical actions of enzymes produced by the bacteria with a corresponding *reaction* on the part of the plant.

The author now thinks that growth is not the result of external stimuli, but rather it is due to the *removal of various inhibitions*; for, as he states, under

normal conditions the physiological brakes are on at all times, more or less, for all animals and plants, and only when they are entirely or largely removed in particular areas, do we observe an unlimited cell proliferation resulting in the hasty and peculiar growths known as neoplasms, or cancers. *The inhibition remover is one that acts locally, disturbing tissue equilibriums within limited areas.*

If the cause of cell proliferation in crown-gall is due to substances liberated in the cell by the parasite, they must be substances either identical with or at least not differing greatly in the physical or physiological action from those acting on the non-parasitized cell during normal growth and division. There is no evidence of chemical injury either in the tissues surrounding the crown-gall, or in the tumour cells themselves, since they grow and multiply with a rapidity resembling cells of normal young tissues. This removes from consideration actively (killing) poisonous substances.

The questions to be answered are:

1. What are the products of the bacterial metabolism of *B. tumefaciens*?
2. Are any of these products capable of producing cell proliferation if injected into the growing plant?

We know that growth of *B. tumefaciens* in culture media of grape sugar and Witte's peptone causes formation of ammonia and alcohol and acetic acid, as well as carbon dioxide and primary and secondary amines. This production of acids and ammonia suggested to the author that tumours might be formed by the injection of such substances into growing plants.

Experiments were therefore made by injecting into healthy *Ricinus communis*, and *Nicotiana Tabacum* and other species, various strengths of ammonia and ammonium salts; and in many cases tumours were formed. Some striking micro-photographs of Ricinus stems with tumour are shown.

The author concludes that these substances act *osmotically rather than chemically* in producing the tumours, and believes that as a result of the metabolism of an intracellular parasite or symbiont, together with the resultant counter-movements of water and food supply, such tumours are formed in crown-gall and presumptively also in animal neoplasms.

A short list of literature is appended.—*A. B.*

Crusoe's Island: Juan Fernandez. By J. Hutchinson (*Gard. Chron.* May 19–June 16, 1917; with 9 figs.).—An interesting account, chiefly historical. The botany is dealt with in the last portion, commencing on p. 240.—*E. A. B.*

Cucumber Disease caused by Choanephora Cucurbitarum. By F. A. Wolf (*Jour. Agr. Res.* viii. Feb. 1917, pp. 319–328; 3 plates).—The disease is commonly met with on cucumbers, where it causes a blight of the flowers and fruit rot. Infection appears to occur in the corolla and so passes into the ovary, being carried by various species of bees, beetles, and by wind. The fungus may also attack cotton, Althaea, and other Malvaceae. Sporangia, chlamydospores, and zygospores are produced, and may mature on cultures in 24 to 48 hours. Conidia are only known upon the affected parts of the diseased plants.—*A. B.*

Cupressus glabra. By A. B. Jackson (*Gard. Chron.* March 3, 1917, p. 95; with fig.).—The sixteenth of the critical notes on Conifers in this series. An American species related to *C. arizonica.*—*E. A. B.*

Cypress and Juniper Trees of the Rocky Mountain Region. By George B. Sudworth (*U.S.A. Dep. Agr., Bull.* 207, July 17, 1915).—Describes the distinguishing characters, distribution, and forest habits of all the known species of *Cupressus* and *Juniperus* growing within the Rocky Mountain region.

Arizona cypress grows in moist or rather dry, rocky, shaly, or gravelly soils on mountain slopes, and in the bottoms and on the sides of cañons, at elevations between 4,500 and 8,000 feet. It is especially fond of moist north-slope gulches and benches where the growth is more dense than in drier situations.

For the most part it forms pure or nearly pure stands, quite dense on the more favourable sites. The largest and best-formed trees occur on north slopes, in coves, and on benches in protected localities, where the soil is moist, deep, and more permeable, while short stunted trees are found in exposed places where the scanty soil is drier and less permeable.

Smooth Cypress.—The first reference to this new and handsome cypress was published in 1895, and was based on the discovery of a grove on Pine Creek at "Natural Bridge," Central Arizona, by Professor J. W. Toumey, who believed the tree to be a form of Arizona cypress. It was not distinguished from the latter tree, however, until February 1910, when it was named and described from a

grove of trees discovered by Mr. Arthur H. Zachau on the north slope of a tributary stream on the west side of the Verde River Cañon, about sixteen miles south-east of the town of Camp Verde, Arizona.

In general appearance the foliage of smooth cypress resembles that of the Arizona cypress, though the former species can be distinguished from the latter by the compact, narrowly oval, or somewhat pyramidal crown. The branches of smooth cypress, particularly of younger trees, are strongly upright.

Old trees grown in the open develop long, lower branches, which from their great weight are less upright than those of trees of the same age in a close stand. In height the trees range from 25 to 30 feet, and in diameter from 10 to 14 inches, though much larger trees probably exist. The trunk is slightly tapering, while the upper portion is sometimes divided into several branches, in this respect differing from the usual undivided stem of Arizona cypress. Only about one-fourth to one-third of the trunk is clear of branches. The most distinctive characteristic of this tree is its thin, smooth, dark purple-red bark.

Twelve tree junipers inhabit the United States. Nine of them occur within the Rocky Mountains, one is confined to California, and two are found only in the eastern United States.

Juniperus monosperma is commonly called merely 'cedar' or 'juniper.' The name one-seed juniper is appropriate because the small berries usually contain but one seed. This one-seed character, however, cannot be depended upon to distinguish *J. monosperma* from Utah juniper and *J. megalocarpa*, since both of these have one-seeded fruits.

It commonly produces several small trunks from a single root-stock, these stems varying in height from 6 to 20 feet and in diameter from 3 to 6 or more inches. The general appearance is often that of a low-crowned, overgrown bush. Single-stem trees are rare, occurring chiefly in protected places. Their height varies from 30 to 50 feet, or occasionally more, with a diameter of from 12 to 24 inches. In all cases the trunk is rather short, often deeply fluted, and widely buttressed. The wood of one-seed juniper is very narrow-ringed, hard, and heavy, with a slight cedar-like odour. The sap-wood is nearly white and from three-fourths to about two inches thick, usually much thinner in old trees than young. The wood of mountain cedar is moderately heavy (about 43 lb. a cubic foot, seasoned), rather hard, exceedingly narrow-ringed, and of a clear cinnamon-brown colour, interspersed with irregular paler streaks. The sap-wood is very thin, seldom more than one half of an inch thick. Freshly cut, dry, or green wood has a strong cedar-like odour. The heart-wood is very durable, and the best sticks are used for fence posts, telephone and telegraph poles, and light-traffic ties. It is used locally for fuel.

The wood of old trees is brittle and can be cut with an easily parted chip, qualities that make clear sections suitable for pencil wood.

The hard heavy wood of Utah juniper is generally very narrow-ringed, the rings in stunted trees being extremely narrow.

The sap-wood is very thick and white, while the heart-wood, of a light yellowish-brown colour, is less pungent in odour than that of other junipers. When thoroughly seasoned the wood is exceedingly durable. Utah juniper is too small and imperfect in form for commercial purposes, though where it is abundant the wood is much used for fuel and fence posts.

J. megalocarpa is one of the largest and best formed of our south-western junipers. It varies in height from 30 to 50 feet, and in diameter from 2 to 4 feet. The crown is compact, broadly pyramidal, with short, stout branches.

Alligator juniper is unique in the thick, sharply checkered bark of its trunk, the resemblance of which to the body scales of an alligator suggested its widely accepted common name, a characteristic which also distinguishes it sharply from all other native junipers. It is sometimes known as 'oak-barked juniper' and 'thick-barked juniper.'

The wood of alligator juniper is rather light, soft, brittle, and very narrow-ringed. The sap-wood is comparatively thin and of a pale straw colour; the heart-wood is light brown with a faint reddish tinge, irregularly marked with paler streaks.

Drooping juniper varies in size from a bushy tree 8 to 10 feet in height and 3 to 6 inches through to one of medium size from 29 to 25 feet tall and 12 to 20 inches in diameter. The best developed specimens have straight trunks, clear of branches for from 19 to 15 feet, and rather open, narrowly pyramidal crowns. Trees growing in dry, exposed places are rarely over 10 feet high, densely branched to the ground, and have a dome-shaped crown. The crown is composed of wide-spreading branches, at the ends of which the slender, drooping twigs give the tree a graceful, weeping appearance. In the case of trees growing in deep shaded cañon bottoms the drooping habit is especially pronounced, the pendent

branchlets often being a foot or more in length. Trees on exposed, drier slopes have very much shorter twigs.

The wood of drooping juniper is a clear yellowish-brown, with a rather thick layer of nearly white sap-wood. It is moderately hard and heavy, straight-grained, and very narrow-ringed.

Freshly cut wood has a strong cedar odour. Seasoned heart-wood is very durable, and has been extensively used locally for mine timbers and to a limited extent for fence posts.—*A. D. W.*

Cypress, The Southern. By Wilbur R. Mattoon (*U.S.A. Dep. Agr., Bull.* 272, September 27, 1915).—In the amount of lumber produced in 1913 cypress ranked sixth of the conifers. On account of the durability of the heart-wood and its moderate softness, which makes it easily worked, cypress is a wood of high value.

Cypress trees not uncommonly reach an age of over a thousand years, a height of from 120 to 130 feet, and a diameter above the basal swell of from 8 to 10 feet. Cypress is very persistent in growth, and is one of the few conifers which successfully sprout from the stump.

The total cut of cypress lumber in 1913, exclusive of lath and shingles, was 1,097,247,000 board feet. Since shingle and lath are made from the slabs and other kinds of " mill waste," and poles and ties are usually cut from small sizes not considered in the original estimates, the relation of cut to the total standing timber is unaffected by the lack of any figures for the smaller products.

It is resistant to decay when in contact with moisture.

It is used extensively for outside finish of buildings. On account of its freedom from taste and great durability it is used for tanks, vats, tubs, and wooden buckets in water storage, creameries, breweries, bakeries, and dye works, distilleries, and soap and starch factories. In the construction of green-houses, where wood is subjected to extremes of heat and moisture, cypress is used probably more than any other wood. It is also a leading wood for pumps, laundry appliances, caskets, and coffins. Cypress is extensively used through the south in the construction of picket fences, which there remain the standard form of yard fence.

In the moist hot climate of the South, split cypress shingles have outlasted all other roofing materials commonly used, except the best grade of slate and tiles. While the ordinary sawed shingle is very durable, the relatively high value of cypress wood has resulted in cedar taking the lead as shingle material.

A. D. W.

Damping off of Coniferous Seedlings, The Control of. By C. Hartley and R. G. Pierce (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 453, Jan. 1917, pp. 1–32; 5 figs.).—The damping off of seedlings of coniferous plants is caused by the fungus *Pythium de Baryanum* Hesse, but *Fusarium moniliforme* Sheldon, and *Corticium vagum* var. *Solani* are often met with.

The disease causes much loss to nurserymen, and is primarily due to faulty cultivation. The importance of well-drained and aerated beds cannot be too much insisted upon in any control measures. Since the alkalinity of the soil favours the disease, the addition of lime or wood ashes should be carefully regulated. Soil disinfection, however, is by far the best method of combating damping off; and of these the most satisfactory are copper sulphate, zinc chloride, formaldehyde, sulphuric acid, etc. From the results obtained it is entirely possible and practicable to control this disease by soil disinfection.—*A. B.*

Diamond-Back Moth, The Life-History of (*Plutella maculipennis*). By H. C. Marsh (*Jour. Agr. Res.* x. pp. 1–10, July 1917; 2 plates).—The diamond-back moth (*Plutella maculipennis*, Curtis) is widely distributed in the United States. The larvæ are slender green caterpillars which attack numerous species of Cruciferae, and cause much damage to cabbage, cauliflower, rape, and turnip. The life cycle from egg to adult is completed in from 16 to 47 days.

Though this pest develops rapidly and is capable of considerable damage, it is usually held in check by parasites (ichneumons and *Microplitis*), and it may also be readily controlled by use of a spray of Paris green (2 lb.), soap (2 lb.), and water (100 gallons).—*A. B.*

Douglas Fir Pitch Moth. By Josef Brunner (*U.S.A. Dep. Agr., Bull.* 255, July 22, 1915).—The Douglas fir pitch moth much resembles, especially when in flight, certain wasps and flies.

The ground colour of the insect is black, with rich orange-red spots on the thorax, and with all the segments, except the last, banded with the same colour.

Underneath the whole insect is rich orange-red. Aberrations in colour are not frequent but exist, as the rearing of a wholly black female would indicate. The fore wings are transparent, opalescent, with black borders and prominent discal mark; the hind wings transparent, with slight discal mark and narrow black margin. Destruction of the larva is the only remedy that can be used to reduce an infestation. That the financial loss caused by *Sesia novaroenis* in Douglas fir product is great, and represents a greater leak in profits to manufacturers than any other avoidable item, is evident.—*A. D. W.*

Dusting and Spraying of Stock Nursery. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Bull.* 385, Jan. 1917, pp. 338–361; 9 figs.)—The results of experiments during 1915 and 1916 indicate that the application of suitable powdered materials, with air as a carrier, will control certain leaf diseases of nursery stock as well as the commonly employed fungicide applied as a spray with water as a carrier.

The dust mixture of 90 parts of finely divided sulphur (200 meshes to 1 inch) and 10 parts of equally finely powdered arsenate of lead controlled the leaf diseases of horse-chestnut, currant, plum, cherry, quince, and rose in the nursery, and it is reasonable to suppose that similar results might be obtained for such diseases on mature trees in orchards.

The dusting method is more expensive, but the applications can be made in a much shorter time and more thoroughly than by spraying. Great care should be taken that only extremely finely ground materials are used in dusting mixture, as only such material will adhere to the foliage.

Experimental work is suggested to determine the value of this process in the control of other diseases and to lessen the cost as far as possible.—*A. B.*

Elsholtzia Stauntoni. (*Le Jard.* vol. xxxi. p. 825; 1 fig.)—*Elsholtzia Stauntoni* is a hardy shrub from Mongolia; it is about three feet high, and bears clusters of dark pink flowers in September and October. The leaves are aromatic.
S. E. W.

Endemism and the Mutation Theory, On. By H. N. Ridley (*Ann. Bot.* vol. xxx. no. cxx: Oct. 1916).—This paper controverts the opinions of Dr. J. C. Willis, published in "Ann. Roy. Bot. Gard. Perad." vol. iv. p. 2, and in "Ann. Bot." vol. xxx. 1916, p. 1, which deals with the rise and fall of species in Ceylon.

Dr. Willis's views are, briefly, that it will need a geological submergence or some such accident to kill out a very common species; that endemic species are the youngest, and of these the very rare the most recent; that all mutations are at once fixed, and the new form will not revert to the old one; that the theory of Natural Selection does not hold good.

The author quotes much evidence of a contradictory nature to the above. He cites the case of *Hedychium coronarium* L. and *H. flavescens*, both conspicuously abundant round Peradeniya and Kandy in 1888, which had entirely disappeared in 1913 without any apparent reason. He mentions, as examples of the destruction of species by enemies such as insects, fungi, and bacteria, the shrub *Lantana mixta*, at one time very common all over the waste ground in Singapore, which became comparatively scarce owing to the ravages of a small green bug that attacked the young fruits and thus prevented seed propagation; and the white-tailed rat of Christmas Island, counted in millions in 1886, but exterminated by 1904, supposedly by the brown rat introducing some bacterium (possibly the plague). The destruction of plants by man may be effected by plantations on a large scale and by destroying forests, and it may be brought about by climatic changes, *e.g.* the disappearance of the epiphytic fern *Polypodium sinuosum* from gardens of Singapore in 1905, after an extraordinary dry and hot spell lasting for a month or two, and the palaeobotanic records reveal innumerable instances of the extinction of species without any evidence of geological cataclysms in all such cases.

Endemics are the relics of an old flora rapidly disappearing. Natural Selection is the only theory at present which accounts for the adaptation of plants to their surroundings, and in this Dr. Willis's mutation theory entirely fails, for it cannot explain, for instance, why *Calophyllum inophyllum*, whose fruits are adapted for sea dispersal, occurs only on the sea shore, or why *Crinum asiaticum*, with flowers only fertilizable by a crepuscular sphingid, only opens its flowers exactly at the time of the appearance of the moth. With regard to mutations, every botanist knows that variations occur in plants which do not appear again in their offspring. The Lalang Grass of Malay is referred to as showing how a plant may adapt itself to nearly any conditions. It possesses an underground rhizome which can flourish at a depth of sixteen inches, and, if dug up, any

portion of it can reproduce itself; it is uninjured by heat or drought or forest fire, the leaves springing up again and growing an inch a day, and the author has seen it growing in the sulphurous smoke of a volcano in Java.—*G. D. L.*

Endothia parasitica and Related Species. By C. L. Shear, N. E. Stevens, and R. J. Tiller (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 380, Jan. 1917, pp. 1–80; 5 figs., 23 plates).—The importance of this group of fungi was first recognized when the chestnut blight fungus was discovered in 1904.

Endothia gyrosa (Schw.) Fr., the type of the genus, is divided into two sections. In section 1 the ascospores are short and pseudoseptate. There are two species: *E. gyrosa* found on five hosts—Castanea, Fagus, Quercus, Vitis, and Liquidambar; and *E. singularis* found on Quercus.

In section 2 the ascospores are oblong, fusiform, and uniseptate. There are four species and one variety, as follows:

Endothia fluens found on Castanea and Quercus in America, but in Europe has been found on Alnus, Carpinus, Ulmus, Corylus, Aesculus, Fagus, and Juglans.

Endothia fluens mississippiensis is only found on Castanea and Quercus, *Endothia tropicalis* found on Elaeocarpus, *Endothia longirostris*, and *Endothia parasitica*, which is found on Acer, Carya, Quercus, Rhus, and Castanea. On the last named it is actively parasitic, and is the cause of the chestnut blight.

A list of literature referring to this fungus is appended.—*A. B.*

Exosmosis, Studies on. By S. C. Brooks (*Amer. Jour. Bot.* Nov. 1916, vol. iii. No. 9, pp. 483–492).—The author points out that osmotically active substances may diffuse out of the cell, and this diffusion should be carefully noted in experiments on permeability when the turgidity of plant cells is used as a standard. This is often overlooked, and is an important source of error.

The conclusions drawn from a number of carefully devised experiments with the peduncle of *Taraxacum officinale* and specially prepared reagents are as follows:

Sodium salts increase the rate of exosmosis of other electrolytes from the protoplasm of *Taraxacum officinale*, while calcium salts reduce this rate.

A solution may be prepared consisting of a mixture of various salts in proportions such that, when used at a concentration isotonic with the protoplasm, it causes no appreciable alteration in the permeability of the plasma membrane of *Taraxacum officinale*.—*A. B.*

Farm Manures, Composition and Value of. By O. F. Jensen (*U.S.A. Exp. Stn. Mich., Circ.* 25, May 1915).—A useful treatise on farmyard manures, their values (1) as plant foods, (2) in relation to the kind of food given to animal, *i.e.* the value of certain foodstuffs when given to the animal, from the point of view of manure returned to the farmer.

The author states that the value of animal manures is not so much in their fertilizer content per ton, although this is very important, but owing to the humus present they make a great alteration in physical condition, by the power they have of increasing the aeration, warmth, and water-holding capacity of soils, and also their lasting effects.—*C. P. C.*

Farm Manures, Losses and Preservation of. By O. B. Winter (*U.S.A. Exp. Stn. Michigan, Circ.* 25, May 1915).—The author shows that under the best possible conditions at least 15 per cent. to 20 per cent. of the fertilizing elements are lost, but under the usual conditions in most farms as much as 50 per cent. is actually thrown away.

The worst floor for stables is one of puddled clay, closely followed by planks. It is suggested that all stables should have a water-tight bottom running down to a tank at rear.

Another heavy cause of loss is the practice of placing manure in heaps in the fields, and allowing such heaps to stand exposed to the weather.

Absorbents recommended for the prevention of avoidable losses are straw, fine earth, peat.—*C. P. C.*

Ferns, Eradication of, from Pasture Lands. By H. R. Cox (*U.S.A. Dep. Agr., Farm. Bulletin* 687, Sept. 1915; figs.).—The hay-scented fern (*Dennstaedtia punctilobula*) and the brake fern (*Pteris Aquilina*) have become serious pests in pasture land in the United States.

This bulletin gives an account of attempts to exterminate the hay-scented fern in the Eastern States. Spraying, cutting, and burning were all tried. In most situations cutting, or cutting and burning, are in practice the most effica-

cious and cheapest methods of subduing the growth. It is almost impossible permanently to eradicate the fern. Where spraying seems the most convenient cure, salt is the best material to use, 150 pounds of salt dissolved in 60 gallons or more of water to the acre for each application is sufficient.—*M. L. H.*

Fertilizer Problem from the Vegetable Grower's Standpoint. By C. E. Durst (*U.S.A. Exp. Stn., Illinois, Circ.* 182, May 1915; figs.).—Though the general principles of soil fertilization are of course always the same, there are marked differences in their application to vegetable and to farm crop production. In crop-growing, quantity and proper maturity are the only objects to be aimed at. The vegetable-grower has many more points to take into consideration. Relatively small differences in earliness, flavour, quality, or size may make all the difference in the value of his crop, and the margin of profit is so much larger as a rule that there is scope for more costly methods of cultivation. The whole question is reviewed.—*M. H. L.*

Fertilizers, The Nitrogen of Processed. By E. C. Lathrop (*U.S.A. Dep. Agr., Bull.* 158, November 1914).—Waste organic compounds or base goods, such as hair, garbage, tankage, leather scraps, etc., are mixed with rock phosphate, and treated in a den with sulphuric acid.

The mass is allowed to stand for several days, until cool enough to handle.

A hydrolysis of the proteins takes place, and the crude non-available types of nitrogen present are changed into much more available forms, and field experiments show that such fertilizers give equal and in some cases better results than dried blood and the other high-grade materials.

The above method is strongly recommended as a method of treating low-grade waste products to increase the sources of plant nutrition. The higher grades of organic compounds are becoming too scarce and expensive to be economical as plant foods, this being due largely to their use as animal and poultry foods.
C. P. C.

Flea Beetles. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1, 1917; pp. 6–7).—These pests appear to wait the advent of suitable crops and dry, sunny weather, when they multiply rapidly. Heavy rain limits or ends their ravages. Young root crops on dry slopes and hill-sides are generally most damaged, and delay in growth, with conditions of weather favouring the beetle, may cause total failure of first sowings and damage to the second.

Comparatively few complaints were received from lands regularly dressed with lime and basic slag. Soaking seed in paraffin proved of benefit. A common weed, *Polygonum Persicaria*, was badly riddled by the beetles.—*R. C. S. R.*

Forest Pathology in Forest Regulation. By E. P. Meinecke (*U.S.A. Dep. Agr., Bull.* 275, April 7, 1916).—It is clear that in the most important branch of forestry, silviculture, the blind adoption of European methods must cause serious difficulties. Even in Germany, many of the fundamental problems of forest organization are steadily discussed, and are far from being considered settled. European foresters have not yet developed a true system or science of silviculture capable of being applied to virgin conditions or to all conditions.
A. D. W.

Fruit Drying. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 13–29, 95–106; 21 figs.).—To dry peaches, apricots, and nectarines whole, dip the fruit in boiling caustic soda solution (1 lb. to 8 gallons of water) for one or two seconds, spread on trays, transfer to the fumigator, where it is exposed to the fumes of burning sulphur for eight to twelve hours. Dry by sun or artificial heat, and then place in calico bags to protect from moths. If the fruit is cured in halves the immersion in caustic soda is omitted. Suitable peaches for drying are 'Elberta,' 'Early and Late Crawford,' 'Salwey' and 'Lady Palmerston.' 'Moorpark' is a good Apricot.

The best prunes are 'Prune d'Agen' and 'Robe de Sergent.' They are dipped in boiling soda solution (1 lb. to 12–20 gallons) until the skin begins to crack. This usually takes from three to ten seconds. After fumigation and drying, the prunes are placed in sweating boxes for three or four weeks, and turned over once a week. Finally, the fruit is dipped in boiling water containing a little salt and some broken prunes for five minutes. It is again dried.

Apples are peeled, cored, sliced by machinery and dropped into weak brine (2 oz. salt to a gallon). The slices are quickly placed on trays and exposed to fumigation until they acquire a nice colour (usually 15 minutes). Dry for six

to eight hours in the evaporator at 120–160° F., and put in sweat boxes for a few days. 'Dunn's Favourite,' 'Rome Beauty,' and 'Granny Smith' are suitable apples for drying. Pears are treated like apples, except that they are cut in half instead of into slices. Figs are treated like peaches. For table raisins, the fully-ripe grapes are dried in the sun; so also are Zante currants. Pudding raisins or lexias are dipped in boiling soda solution (1 lb. in 20 gallons) for three seconds before drying. Two seconds' immersion suffices in the case of sultanas. Grapes grown on a stiff soil do not make good raisins.

Sketches are given of the appliances used.—*S. E. W.*

Fruit Trees, Insects attacking Wood of. By P. Lesne (*Rev. Hort.* vol. lxxxix. pp. 300–302; 1 col. plate).—Life-size representations in colour are given of the Wood Leopard Moth (*Zeuzera pyrina*) and the Goat Moth (*Cossus ligniperda*), and their caterpillars and chrysalids: also of the beetle *Capnodia tenebris* and its larva. Enlargements are shown of *Agrilus sinuatus* and its larva, with the borings it has made in the branch of a pear tree; also the larva and adult Longicorn (*Cerambyx scopolii*), the Shot borer, male and female (*Xyleborus dispar*), and its galleries, and the Bark beetle (*Scolytus rugulosus*).—*S. E. W.*

Fruit Trees, Restoring Mutilated. By C. Arranger (*Le Jard.* vol. xxxi. pp. 131–135; 7 figs.).—In that part of France occupied by the enemy, the Germans have done their worst to ruin the orchards. The fruit trees have either been cut down at a height of three feet from the ground or a circle of bark has been removed from the tree to stop the flow of sap. In the latter case the results of this despicable outrage have been repaired by the process of bridge grafting. The grafts are arranged round the stem at a distance of two inches apart, bridging the space where the bark is removed. They are held in place by grafting-wax and strong string or wire. Crown grafting is resorted to, when the tree is cut down.—*S. E. W.*

Fruit Trees, Sun Scald of. By A. J. Mix (*U.S.A. Exp. Stn., Cornell, Bull.* 382, Oct. 1916, pp. 235–284; 2 figs., 2 plates).—Sun scald, an injury sometimes occurring to bark and outer sapwood of apple trees, is probably a winter injury, caused by freezing to death of the tissue. This freezing to death is made possible by a rapid temperature fall consequent to warming up of the tissue above freezing by the rays of the sun on a bright cold day in late winter.

Sun scald is a late winter injury as distinguished from crown rot, which is an early winter injury, and may be prevented by spraying or painting the trunk with whitewash and shading the trunk with a board. This injury is one which only occurs in certain years with a considerable intermediate period of immunity, and the prevention would be obviously employed many times unnecessarily for once when it was necessary.

A list of references to this subject is appended.—*A. B.*

Fruiting of Trees in Consecutive Seasons, The. By Spencer Pickering (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—The fruiting of a tree, over a number of years, must take place in one of three ways: the tree may produce about the same quantity of fruit in each year (consecutive fruiting), or it may produce heavy and light crops every other year (alternate fruiting), or the occurrence of heavy and light crops may be quite irregular (chance fruiting). There is a strong belief among horticulturists that a tendency to alternate fruiting exists, and to test this belief the author has kept records of a large number of apple trees and a smaller number of pear trees from 1897 to 1904 at Harpenden and from 1904 to 1913 at Ridgmont. Two methods were employed, viz. (*a*) actual weighing of the crops, (*b*) estimation of the extent to which the trees, regardless of their size, were loaded with fruit. The former method gives rise to error due to differences in size, disposition of branches, and so forth, while in the latter case there will be errors of judgment. The author concludes that there are tendencies both to alternate and to consecutive fruiting, and that conditions of soil and climate determine which of these predominates. The tendency to consecutive fruiting becomes more marked as the age of the tree increases, and is also greater in the case of trees on the crab stock.

There is no doubt, however, that for the majority of varieties external conditions, *i.e.* chance, are the main factor determining the fruiting of trees: at Ridgmont chance was potent to the extent of 90 per cent. The following table, however, does go to show that for two of the varieties studied, viz. 'Stirling Castle' and 'Bramley's Seedling,' in spite of irregularities, there is a marked

tendency to alternate fruiting. The figures are percentages of the crops given by the former in 1900 and by the latter in 1911.

	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.
Stirling Castle .	3	30	6	100	47	144	0	148	0
Bramley . .	—	—	—	—	—	—	—	35	6

	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.
Stirling Castle	144	38	95	171	264	78	47	207	0	549
Bramley .	7	20	7	103	9	100	0	103	0	159

J. E. W. E. H.

Fumigant, Para-Dichlorobenzene as an Insecticide. By A. E. Duckett (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 167, December 1915).—Para-dichlorobenzene is a colourless crystalline substance (5·1025 times as heavy as air), which volatilizes readily in normal circumstances.

It is harmless to human beings and domestic animals under ordinary conditions, but is a good specific poison for many insects.

Para-dichlorobenzene proved especially efficacious against :—

1. Stored product insects. 2. Case-bearing clothes moths. 3. Cockroaches and ants. 4. Museum pests. 5. Miscellaneous house insects, including flies, carpet beetles, book lice, mosquitos, etc. etc.—*C. P. C.*

Fusarium Blight of the Soybean. By R. O. Cromwell (*Jour. Agr. Res.* viii. March 1917, pp. 421–439; 1 plate, 1 fig.).—The causal organism is found to be *Fusarium tracheiphilum* Smith., and the disease is characterized by a chlorosis and shedding of leaves, and ultimately the death of the plant ensues. Cultural and morphological studies show that the organism producing the disease on the soybean is identical with the organism producing the wilt of cowpeas, and inoculation experiments show that cross inoculations can be made. Infection probably occurs through the roots, and a coarse sandy soil appears to favour the development of the fungus.

A fairly complete bibliography is given.—*A. B.*

Gas, Illuminating, The Response of Plants to. By Sarah L. Doubt (*Bot. Gaz.* vol. lxiii. No. 3, March 1917, pp. 209; 6 figs.).—Among the responses shown by various plants to illuminating gas were :

(1) Leaf fall. One part of illuminating gas per 1000 of air caused leaf fall in *Salvia splendens*, *Mimosa pudica*, &c.

(2) Epinastic growth of petioles. Traces of gas (50 per 1,000,000 of air) produced this effect in a number of plants investigated. [It is impossible to detect less than 1 part of gas to 400 of air by the sense of smell.]

(3) Proliferation tissue in cortex of the stem below the ground was shown by the apple, pear, ash, and elm as the result of gas escaping into the soil. (Certain bedding plants were found to be injured by the same cause : others were killed outright : others dropped their leaves or exhibited epinastic growth of petioles.)

(5) Root tubercles were produced by traces of gas upon the roots of certain plants, *e.g.* the apple and pear.

The authoress makes the following practical suggestions for florists : To detect illuminating gas in a greenhouse, some vigorous plants of one of the following should be utilized : tomato, castor bean, scarlet sage, or sensitive plant. They should have from six to twelve or more leaves. These should be placed at various locations throughout the greenhouse and left from twenty-four to forty-eight hours with poor ventilation. All will respond to traces of illuminating gas within this period at ordinary temperatures.

With only a trace of gas present in the air the epinastic response will be noticeable, and the bending down of the leaves will increase with the concentration of gas present. All these plants will drop their leaves with a concentration below the limit of the odour of gas. The older leaves fall first, the younger leaves being retained until there is one part of illuminating gas to 1000 of air.—*R. J. L.*

Gerbera Jamesoni fl. pl. By C. Albert (*Le Jard.* vol. xxxi. p. 156).—A double variety of *Gerbera Jamesoni*, raised on the Riviera, is of great ornamental value. The flowers are six inches in diameter with three rows of petals. The flowers exhibit a great variety of colour—pink, salmon fawn, amber, &c. The plants thrive on a rich, well-drained soil.—*S. E. W.*

Gladiolus, Hard Rot Disease of. By L. M. Massey (*U.S.A. Exp. Stn., Cornell, Bull.* 380, Sept. 1916, pp. 150–181; 7 figs., 2 plates).—The disease

attacks the leaves and corm, forming brownish areas more or less circular in outline. In the leaves these areas after a period decay and sometimes drop out, giving a shot-hole appearance to the leaves.

The causal organism is *Septoria Gladioli* Passer, and produces pycnidia. It is able to survive the winter.

To control, soil disinfection is suggested, and destruction by fire of infected plants should invariably follow the discovery of the disease.

A short bibliography is given.—*A. B.*

Grafting in Victoria. By E. E. Pescott (*Jour. Agr. Vict.* Sept. 1916, p. 574).—The most useful method of re-working old trees is to cut the head right off, leaving only the stump. The old method of cleft-grafting has been superseded by the bark or crown graft. The latter method does not cause any damage to the wood, and thus with care no rotting can take place. The best method of bark-grafting is the saddle graft; the graft being inserted in the bark, and a strip of bark is carried right across the trunk and inserted in the bark on the opposite side. This method takes more time than the ordinary bark graft, but it ensures a much quicker healing over of the old stump.—*C. H. H.*

Grapes, Inheritance of Certain Characters of. By U. P. Hedrick and R. D. Anthony (*Jour. Agr. Res.* iv. pp. 315–330; July 1915).—This interim report on about 10,000 seedling grapes demonstrates certain of their unit characters. White is pure and is recessive to both black and red. No black or red variety has proved pure for colour. Self-sterile varieties usually have reflexed stamens, but breeding from upright stamens only will not eliminate, though it will decrease, the number of seedlings with reflexed stamens. Nearly 3,000 selfed varieties were grown, but they proved uniformly lacking in vigour, and were lower in quality than crossed seedlings. No definite conclusion was arrived at as to the form of the berry, but the size seems to be determined largely by the parentage, there being no indication of dominance. The season of ripening of the parent influences the season of the offspring.—*F. J. C.*

Greenhouse, Some Important Insect Pests of the. By R. D. Whitmarsh (*U.S.A. Agr. Exp. Stn., Ohio, Circ.* 154; May 1915; 10 figs.).—The Circular deals with fumigating with cyanide for white-fly, mealy-wing, and snowy-fly, spraying for red-spider and fumigating and spraying for aphids.

Minute details are given for cyanide fumigation.—*V. G. J.*

Helianthus, A New Hybrid Race of (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. p. 121, Aug. 1916).—MM. Cayeux and le Clerc have produced what seems to be a most valuable strain of Helianthus—the progeny of a cross between *H. cucumerifolius* var. *purpureus* and *H. annuus* var. *gaillardioides*. The flowers show an enormous variety of colour and the plants bloom abundantly.—*M. L. H.*

Herb Industry. By Muriel E. Bland (*Irish Gard.* xii. pp. 40 and 41).—On the great possibilities of the herb industry in Ireland. Makes a strong plea for the co-operative cultivation of herbs rather than encouraging the individual to cultivate any or every herb his fancy may select. Undoubtedly herb-growing in Ireland has made a very good start, and there seems no reason why it should not become a lucrative industry after the war.—*E. T. E.*

Home Grounds, The. By E. G. Davis and R. W. Curtis (*U.S.A. Exp. Stn., Cornell, Bull.* 361, June 1915; figs.).—With a shifting and pioneer population such as that in many parts of America, it seems that there is still scope for argument and suggestions on the advantages of flower gardens and ornamental planting.

This bulletin contains both—a statement of first principles as applied to the art of landscape gardening, some diagrams showing how these principles may be applied to small holdings, and concludes with carefully classified lists of suitable trees, shrubs, roses, creepers, bulbs, annuals, shrubby and herbaceous perennials. *M. L. H.*

House-fly Control: A Maggot Trap. By R. H. Hutchison (*U.S.A. Dep. Agr., Bull.* 200, May 4, 1915, pp. 1–15; 3 plates, 4 figs.).—Describes a method of destroying the maggots of the house-fly by means of barnyard manure heaped on a wooden platform over a specially constructed concrete basin. Larvæ migrating from the manure drop into water in the basin and are drowned. The results seemed to show that at least 98 per cent. of the larvæ breeding in the manure were destroyed. Among the advantages claimed are (1) comparatively small cost, (2) small amount of time and labour required, (3) the ease with which wagons or manure-spreaders can be loaded from the platform, (4) its adaptability for use

where the production of manure is large, and (5) the fact that compactness and high moisture content, which render the trap most effective, are conditions which tend to preserve the value of the manure.—*F. G. A.*

Humogen, Experiments with. By M. F. F. Sutton (*Bull.* 8, *Messrs. Sutton, Reading,* June 1917).—A series of experiments with humogen (bacterized peat), in comparison with other manures, was started in 1917. Some adverse results are recorded, and in general the results were not in favour of humogen, which also varied in its effect according to the source from which it was obtained.—*F. J. C.*

Hybridization, Sterility as the Result of Hybridization and the Condition of Pollen in Rubus. By C. S. Hoar (*Bot. Gaz.* vol. lxii. Nov. 1916, pp. 370; with plates x.–xii.).—The author draws the following conclusions :—

1. Sterility of pollen has long been recognized as a criterion of hybridization.
2. Crosses between distinct species have long been known to be more or less sterile and to behave differently from crosses between more closely related forms or varieties.
3. True species when crosses do not, in most cases, follow the laws of Mendel, but tend rather to blend to form more or less constant types, often systematically recognized as species.
4. Many species of the Angiosperms are species in a very different sense from those of the lower plants and of the Gymnosperms in particular.
5. In some cases they are natural hybrids which have external characteristics distinct and constant enough to have specific rank from a systematic standpoint.
6. Although these species may be distinct from the systematic standpoint, yet they must be treated in a different manner from the standpoint of the evolutionist and the plant breeder.
7. Finally, the species of the genus *Rubus*, as shown from the pollen condition and also from external characters, clearly hybridize very frequently in nature, giving rise to constant forms often recognized as true species.—*R. J. L.*

Hymenanthera crassifolia. By F. G. Preston (*Irish Gard.* xii. Jan. 1917, p. 5; fig.).—A desirable shrub for garden purposes, but very seldom seen. Produces white berries, of dense semi-evergreen habit and 4–5 feet high.— *E. T. E.*

Injection Experiments on Plants. By Yasutaro Yindo (*Jour. Coll. Sci. Tokyo,* xxviii. pt. 6, May 1917; plates).—A large number of experiments on growing plants performed with the object of ascertaining the distribution and rate of conduction of substances injected into various tissues are recorded. The author found the movement of substances dependent to a great extent upon the transpiration current, and mostly in an upward direction. There was, however, some downward diffusion, and to a much slighter extent lateral diffusion. It is not clear whether downward diffusion took place mainly along the xylem or along the phloem, but it seems evident that the demand for water may cause a downward flow along the xylem vessels and away from the leaves under certain conditions. Lithium nitrate solutions were generally used, but staining solutions showed that individual bundles preserve their identity through a great part of the plant.—*F. J. C.*

Insecticide, Warm Water as. By P. Viala (*Le Jard.* vol. xxxi. p. 156).—Vines and orchard trees may be freed from pests by watering the foliage with water at a temperature of 150° F.—*S. E. W.*

Iris arizonica, spec. nov. By W. R. Dykes (*Gard. Chron.* Feb. 3, 1917, p. 45; with Latin diagnosis).—A distinct species allied to *I. longipetala,* raised by Mr. Dykes from seeds attached to a herbarium specimen from Arizona.—*E. A. B.*

Lace-wing Fly, Californian Green. By V. L. Wildermath (*Jour. Agr. Res.* vi. pp. 515–526; July 1916; figs.).—An account is given of the life-history and habits of the Californian lace-wing fly (*Chrysopa californica*). It is in the main similar to that of the common British species, and is found to devour between 300 and 400 aphides during its larval existence.—*F. J. C.*

Leopard-moth: a Dangerous Imported Insect Enemy of Shade Trees. By L. O. Howard and F. H. Chittenden (*U.S.A. Dep. Agr., Farm. Bull.* 708, February 14, 1916).—The leopard-moth, like so many other dangerous pests, is a European species which has been accidentally introduced into the United States in comparatively recent years. Its Old-World distribution, as recorded,

is central and southern Europe, southern Sweden, south-western Africa, Algeria, northern Morocco, and the western portion of Asia Minor.

This species was introduced into the United States some time prior to 1879; in this year a living moth was captured in a spider's web at Hoboken, N.J. In 1887 it was seen at Newark, N.J., but it was not actually recorded as occurring in this country until the following year. In 1890 the moths were observed near electric lights at Orange, N.J. In 1894 its destructive ravages were recognized in Central Park in New York City.

In its Old-World home the leopard-moth is recorded as living on a considerable number of common trees, including elm, lime or linden, ash, beech, birch, walnut, oak, chestnut, poplar, alder, and, rarely, horse-chestnut. Among orchard-trees it is reported to injure pear, apple, plum, and other fruit-trees.

In the United States it attacks all of these trees, and in addition practically all of the maples, ash, mountain-ash, tulip-tree, dogwood, aspen, and willows, and such shrubs as privet and lilac and honeysuckle. A list of eighty-three trees and shrubs which this larva has been actually observed to attack was compiled in 1894; seventy-seven of these were observed in the public parks of New York City alone. A later list contains 125 species and varieties.—*A. D. W.*

Life in Solutions of Colloidal Silica, On the supposed Origin of. By S. G. Paine (*Ann. Bot.* July 1916, vol. xxx. no. cxix.; pl.).—The author has repeated the experiments of the late Dr. Charleton Bastian, who held firmly to the view that living organisms may arise *de novo* from non-living materials. Dilute solutions of colloidal silica mixed with phosphoric acid or with some form of colloidal iron are enclosed in special tubes and undergo intermittent sterilization at 100° C., or short exposures to temperatures of 120°–130° C. During the exposure to light in an east window for periods varying from six months to two years, a small deposit collects in the base of the tubes, and this is carefully withdrawn and examined microscopically. Eighty-five tubes of colloidal silica were examined, and the amorphous deposit which collected in them was found to be composed of silica. These bodies are thought to be identical with some of the so-called fungus germs described by Dr. Bastian. It is concluded that the forms resembling organisms depicted by Dr. Bastian as evidence of spontaneous generation of life were in part purely inorganic simulacra formed by slow deposition of silica from colloidal solution, and in part depositions of silica upon dead fungal hyphae which had developed in the solutions before these were filled into the tubes and sterilized.—*G. D. L.*

Lime, Use of, on Land. By F. D. Gardener (*U.S.A. Exp. Stn. Pennsylvania, Bull.* 131, September 1914); **Ground Limestone for Acid Soils.** By J. F. Baker and R. C. Allinson (*U.S.A. Exp. Stn. New York, Bull.* 400, March 1915); **Liming the Land for Maintenance of Fertility**. By C. E. Thorne (*U.S.A. Exp. Stn. Ohio, Bull.* 279, July 1914).—All the above-mentioned bulletins deal with the same subject, and practically in the same manner. They deal exhaustively with the various kinds of lime, and give results of field tests. On the whole, ground limestone has proved itself to be quite as effective as either caustic or hydrated lime, provided an equivalent quantity is given. For practical purposes the following are suggested as equivalents: 1,000 lb. burnt or caustic lime, 1,500 lb. hydrated or slack lime, or 2,000 lb. ground limestone.—*C. P. C.*

Luculia gratissima. By J. Binter (*Le Jard.* vol. xxx. pp. 84, 85; 1 fig.).—The only satisfactory method of propagating *Luculia gratissima* is from cuttings. These are inserted in a mixture of loam (1), peat (1), and sand (4 parts), in well-drained pans with the base of the cuttings nearly touching the drainage. Cover with a bell-jar, syringe frequently, and keep in a temperature of 75° F. Give shade until the roots are formed, which requires four or five weeks, then repot. The final potting takes place in July, using a mixture of loam (2), peat (1), and one part of horse-dung or leaf-mould mixed with sand.

L. Pinceana bears flowers which are nearly white. It is less frequently seen in cultivation than the preceding.—*S. E. W.*

Maize Seed. By Wenholz (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 229–243; 9 figs.).—In selecting maize for seed, those ears should be chosen that are fully and tightly covered by the husk, as they are better protected from the attacks of the rice weevil (*Calandra oryza*). Fumigation with carbon bisulphide for twenty-four hours in an air-tight vessel with subsequent exposure to the air, is the best protection from damage by insect pests. The seed is stored in bins containing 1 lb. of naphthaline to each 40 bushels of maize.—*S. E. W.*

Moisture, Movement and Distribution of, in the Soil. By F. S. Harris and H. W. Turpin (*Jour. Agr. Res.* x. pp. 113–156, July 1917; 31 figs.).—The authors state that during recent years great differences of opinion exist as to the importance of soil capillarity of moisture and the laws governing the final distribution of moisture in the soil. As a result of several thousand moisture determinations conducted under the varying conditions of moisture, and with fallow, manure, surface mulches, crops, irrigation water, cultural methods, and seasonal conditions in the field, the authors arrived at the following conclusions: the moisture content of fallow averaged higher than that of cropped soils, but irrigation influenced the top surface of cropped plots more than the top surface of the fallow. Water did not appear to penetrate the fallow plots below 7 feet as readily as it did in the cropped plots. Wheat, maize, potatos, and peas drew the greater part of their moisture from the first 4 feet in depth.

The increase in moisture due to 5 to 7·5 inches of irrigation water was felt at depths of 10 feet in twenty-four hours, although most of the increase was in the first 4 feet. Mulches prevent the loss of water under both irrigation and dry farming to several feet of soil, though the surface foot is mostly affected.

Sand containing 7·77 per cent. of water gave up its moisture to loam more readily than did loam with 31·00 per cent. of water, or clay with 24·62 per cent. of water.

Water rose to a height of over 30 inches in a loam soil from a moist sand in ninety-four days, while from a clay soil it rose little more than 6 inches during a similar period.

A short bibliography is appended.—*A. B.*

Mutants of the Oenotheras, New Dimorphic. By Hugo De Vries (*Bot. Gaz.* vol. lxii. Oct. 1916; 5 figs.).—Besides *Oenothera scintillans*, which splits under ordinary circumstances in every generation into nearly equal groups of plants of the same type and others of the type of *O. Lamarckiana*, De Vries has cultivated pedigree families of four other mutants of *O. Lamarckiana*, which behave in the same manner. They are designated as *O. cana*, *O. pallescens*, *O. Lactuca*, and *O. liquida*. Their Lamarckiana-like offspring are constant in their progeny. Besides the two main types, they produce, as a rule, a relatively high percentage of other mutants.

The parental type is on the average reproduced in about 40 per cent. of the seedlings, the other 60 per cent. being *Lamarckiana*, with some mutants; but these figures vary considerably.

In the dimorphic mutants, the special characters are handed down to the next generation through the ovules only. The pollen lacks these characters, and is, as far as investigated, not different from that of pure *O. Lamarckiana*.

De Vries concludes that the dimorphic mutants constitute a group in which the hereditary phenomena are evidently independent of the external visible characters of the special members of the group, but that they must be assumed to have the same intrinsic causes in the different cases.—*R. J. L.*

Narcissus, Investigation of Bulb Rot of Narcissus. Part I. **The Nature of the Disease.** By E. J. Welsford (*Ann. Appl. Biol.* iv. p. 36; Sept. 1917).—Various organisms found in unhealthy bulbs were isolated and infection experiments carried out, but the disease, the symptoms of which are fully described on p. 51 of this Journal, was reproduced only by infection with the stem eelworm, *Tylenchus devastatrix*. A review of some of the literature of this pest is given, and special reference is made to Ritzema Bos's work on the Hyacinth rot, which is essentially similar to this, and which he called *la maladie annulaire*. The author recommends that weeds should not be allowed to wither on the ground which it is intended to replant with Narcissi, nor should they be dug in; Narcissi should not be planted where eelworm-infested Narcissi have grown; only healthy bulbs should be planted; bulbs that fail to grow should be dug up before they rot; bulbs with crinkly foliage should be burnt; dying foliage should be collected and burnt. *F. J. C.*

Nectar Secretion, Environmental Influences on. By Leslie A. Kenoyer (*Bot. Gaz.* vol. lxiii. No. 4, April 1917, pp. 249).—This is an account of the investigations undertaken to summarize and supplement existing knowledge of the factors which stimulate or retard the secretion of nectar. The effects of humidity, water supply, temperature, atmospheric pressure, and light are dealt with. The general conclusion arrived at was that the more favourable all conditions for growth and the more vigorous the plant, the greater is the amount of sugar secreted. Nectar is most abundant early in the blooming season, other things being equal; and accumulation and secretion of sugar is most pronounced near the time of the opening of the flower.—*R. J. L.*

Nicotine as an Insecticide.—By N. E. McIndoo (*Jour. Agr. Res.* vii. pp. 89–122, Oct. 1916; plates).—Experiments carried out by the author failed to demonstrate the entrance of nicotine into the body of insects either through the spiracles or the integuments. The fumes or odoriferous particles, however, of sprays, fumigants, and tobacco powder pass into the tracheae and are widely distributed over the insects' tissues. The nicotine kills the insect by paralysis, the trouble travelling along the ventral nerve cord from the abdomen to the brain. Exactly how the paralysis is brought about is not evident, but the author suggests that it may be by means of interference with oxygen supplies.
F. J. C.

Nicotine Sulphate and Fish-oil Soap Sprays. By L. B. Smith (*Jour. Agr. Res.* vii. pp. 389–399).—A loss of both wetting power and efficiency occurred with higher concentrations of the two sprays mentioned when used on peas, spinach, and strawberries against aphis and red-spider attacks. When more than 4 lb. soap were used with 10 oz. nicotine sulphate to 50 gallons water, or more than 8¾ oz. nicotine sulphate to 5 lb. fish-oil soap to 50 gallons of water, both wetting power and efficiency were reduced.—*F. J. C.*

Nitrogen Fixation and Nitrification, Some Factors Influencing. By B. Williams (*Bot. Gaz.* vol. lxii. Oct. 1916).—In a recent article by Lipman and Sharp it has been suggested that there are really two maxima of fixation with reference to moisture content, the one that is most favourable to aerobic bacteria, and the other at which anaerobic forms flourish best.

The first set of experiments conducted by the author showed that one at least of the free nitrogen-fixing organisms materially deteriorated through the process of drying attendant upon ten months' storage of the soil in the laboratory.

To determine to what extent drying affected the fixing power of the soils as a whole was the object of the next series of tests. It was found that the soils lost 24 to 43 per cent. of their original efficiency for fixing nitrogen during a period of fifteen months' storage.

In tests conducted with a rich garden soil known to have a vigorous *Azotobacter* flora, the nitrogen-fixing flora was found to decrease considerably under the influence of drying. After fifteen months, however, a number of soils retained considerable ability to fix nitrogen, which indicates that some species at least offer great resistance to drying. *Azotobacter* was shown to be more easily attenuated than some other species.

The nitrogen-fixing flora is so intimately connected with the humus content of a soil that this is undoubtedly the most important influence in connexion with the process. It is extremely doubtful whether a toxic condition of the soil exerts inimical effects upon soil bacteria.

In experiments conducted with lime it was found that where there is some development of the nitrifying flora in the soil originally, the effects of lime are decidedly more evident than in those soils apparently devoid of nitrifying power.
R. J. L.

Nitrogen in Fæces, The Fixation of. By E. H. Richards (*Jour. Agr. Sci.* viii. June 1917).—Both horse and bullock manure when fermented in bulk in presence of air and sufficient moisture and calcium carbonate will fix nitrogen. The fixation is brought about by *Azotobacter* and *Bacillus lactis aerogenes* working together. Fixation does not occur in manure from bullocks fed on grass: cake-feeding is essential in their case. The fixation is also reduced greatly in the case of horses fed on grass alone, the greatest fixation occurring when the horses are fed on corn and hay. This is due to the necessity for the presence of carbohydrates for the bacteria to feed on; more of them pass through the stomach of the horse undigested than through the bullock. The quantity of nitrogen added to horse manure as a result of nitrogen fixation may in the most favourable circumstances amount to as much as 50 per cent. of the original nitrogen and be complete in about a month. Nitrogen fixation would also occur in soil manured with horse dung, but the addition of nitrogen in these circumstances would be very small.—*J. E. W. E. H.*

Oenothera Lamarckiana mut. **velutina.** By Hugo De Vries (*Bot. Gaz.* vol. lxiii. No. 1, Jan. 1917, pp. 1–24; with a coloured plate depicting *O. Lamarckiana* mut. *velutina* (*O. blandina*) and *O. blandina* mut. *spiralis*).—The following is the substance of the author's summary of his investigations:—

O. Lamarckiana mut. *velutina* (*O. blandina*) arose from the family of *O. Lamarckiana* mut. *lata* × *semilata* among seeds of the third generation in three specimens. Of one of these a second generation was cultivated, and of one of the others four successive generations: making in all over 3,000 plants. All

of these plants, with the exception of four mutants, were exactly alike. These new mutants constituted the type *O. spiralis* (mutation coeff. 0·1 per cent.). For the appearance of the original mutation only one sexual cell needs to be mutated, since in combining with a normal gamete it may give rise to *O. blandina*, as is shown by the splitting of both the reciprocal crosses of this form with *O. Lamarckiana*. The splitting goes into nearly equal groups of specimens like *O. blandina* and of *O. laeta*.

O. Lamarckiana mut. *velutina* resembles the hybrids of the type of *velutina* so much as to be considered one of them. It is slender, with long internodes in the spike, and with flowers as large as those of *O. Lamarckiana*. It differs from its parent species in that it has lost the property of producing about one-half of empty grains, and almost all of its seeds contain healthy and well-developed germs and germinate easily. This new quality is dominant over that of the parent.

Besides other differences, *O.* mut. *velutina* is distinguished from *O. Lamarckiana* in one other dominant character, the smoothness of its leaves at the time of flowering.

In crosses with those species which split *O. Lamarckiana* and some of its other derivatives into the twin hybrids *laeta* and *velutina*, the *O. velutina* produces only hybrids of the *velutina* type.

The study of this new mutant reveals at least two recessive characters in *O. Lamarckiana*, viz. the bubbles of the leaf-blade and the presence of typical empty seeds. (See also p. 228.)—*R. J. L.*

Olearia Gunniana and its Allies. By J. Hutchinson (*Gard. Chron.* Jan. 6, 13, 20, 1917, pp. 3, 13, and 33; 4 figs.).—Shows that Bentham in the Fl. Austr. included several distinct species under the name *O. stellulata*. Two of these are described as new species, viz. *canescens* and *flavescens*. Others are *lyrata*, *quercifolia*, *stellulata*, *Gunniana* (with vars. *brevipes*, *phlogopappa*, *microcephala*, *angustifolia*, and *salicifolia*), *rugosa*, and *subrepanda*.—*E. A. B.*

Onion Culture. By John W. Lloyd (*U.S.A. Exp. Stn., Univ. of Illinois, Urbana, Ill., Circular* No. 173, June 1914; figs.).—Onion culture is an important industry in the State of Illinois. This circular describes how it may be most successfully carried on either by field sowing, transplanting, or by the planting of autumn-raised sets.

Hints are given for every stage of its cultivation, and advice in the choice of varieties, harvesting, and storing is added.—*M. L. H.*

Onion Fly. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917, p. 11).—The onion fly was noted on leeks. A bed 40 by 15 feet in extent in a farm garden near Borth was totally destroyed by the larvæ, of which from three to seven were obtained in each plant attacked.—*R. C. S. R.*

Onions, Squashes, and Cabbages, To Raise. By W. T. Guptill (*U.S.A. Exp. Stn. Maine, Bull.* 2, vol. xv. June 1916).—Directions for growing, harvesting, and storing onions, squashes, and cabbages in Maine. This bulletin is meant chiefly for raisers of crops for home consumption, but it is not forgotten that they may be glad to dispose of any surplus in the local market.

The importance of good cultivation is insisted on. The writer is not afraid to say that it is more important than manuring. For green caterpillar in cabbages he recommends a heaped hoeful of dirt to be put into the centre of the cabbage. This, he says, is beneficial, and does not interfere with the hearting.—*M. L. H.*

Ophrys, Mimicry among. By H. Correvon (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. Feb. and March 1916).—A note on the fertilization of some species of *Ophrys*. Unlike the orchis, this plant does not produce nectar, and as the blossoms are obviously not self-fertilized it has been a matter of conjecture what attraction they offered to insects. A careful observer of Algerian species communicates the results of his investigations, which have convinced him that the *Ophrys* is fertilized by the male *Colpa aurea*, who hatches out some days before the female, and who is actually attracted by the resemblance of the flower to the mate for whom he is waiting.—*M. L. H.*

Orange, The Navel, and other Brazilian Fruits. By P. H. Dorsett, A. D. Shamel, and W. Popenoe (*U.S.A. Dep. Agr., Bull.* 445, Feb. 10, 1917, pp. 1–35; 24 plates).—The Washington Navel Orange was introduced into the United States from Brazil forty-five years ago. Particulars are given as to its supposed origin, its history, and the method of culture in Bahia. A considerable number of other Brazilian fruits are described in detail.—*F. G. A.*

Organic Matter in the Soil, The Influence of Soil Conditions on the Decomposition of. By E. J. Russell and A. Appleyard (*Jour. Agr. Sci.* viii. June 1917).—Decomposition is brought about by bacteria and other micro-organisms. Previous observers have not been able to establish any particular connexion between the fertility of experimental plots and the number of bacteria found in their soils. But since fertility is determined by a number of factors the authors have endeavoured to determine what the essential factors are and have continued their observations over three seasons. The decompositions observed have been the amount of nitrate formation in the soil and the fluctuations of CO_2 in the soil air. When these two sets of observations, together with the bacterial numbers, are plotted for a twelve-months period the curves show that they are related: a rise in bacterial numbers is accompanied by a rise in CO_2 and, somewhat later, a rise in nitrate. Simultaneous observations of moisture and temperature were made, and it became apparent that temperature is a dominating factor. The reactions are at a standstill from November to March, but as soon as the temperature rises above 5° C. bacterial numbers and nitrate and CO_2 contents all increase. The activity soon begins to fall off, however, in spite of a favourable temperature, and the result is found to be due to another factor, viz. rainfall supplying moisture and dissolved oxygen. The curves for these three factors fit the curves for bacterial nitrate and CO_2 contents fairly well over most of the year, except for a period of depression after the spring rise and a period of autumn activity after the summer sluggishness. Comparison of curves for cropped and for fallow land show that a growing crop is a fourth and detrimental factor.—*J. E. W. E. H.*

Oxidase and Catalase in Plant Tissue, The Relation between. By G. B. Reed (*Bot. Gaz.* Nov. 1916, pp. 409; with 1 fig.).—The author describes experiments which he performed with pineapple juice, which lead him to conclude that catalase is not universally present in living cells.—*R. J. L.*

Oyster Shell Scale, and Scurfy Scale, The. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 723; April 1916; 3 figs.).—The author mentions that minute parasitic wasps are often efficient enemies of the oyster shell scale, and in some localities apparently hold the insect in check. If these wasps are present, small round holes can be seen on the dorsal part of the scale, showing where the adult escaped.—*V. G. J.*

Pavement Ant, The. By L. B. Smith (*U.S.A. Dep. Agr., Virginia Truck Exp. Stn., Bull.* 16; July 1915; 6 figs.).—The pavement ant (*Tetramorium cespitum* L.) is a pest of cold-frame and greenhouse crops. In its European home the species is known as the common "meadow ant." Since its introduction to the States it has adapted itself to city conditions, making its nest beneath pavements, stone-flagging, brick walls, and cobble-stones, becoming often a serious house nuisance, and recently it has been reported as causing injury to certain house and greenhouse plants.

Fumigation with carbon bisulphide has proved the best means of control.

V. G. J.

Peach Scab and its Control. By G. W. Keitt (*U.S.A. Dep. Agr., Bur. Pl. Ind. Bull.* 395, Jan. 1917, pp. 1–66; 6 plates).—This disease causes serious spotting and cracking of the fruit, and spotting of the leaves and twigs. The causal organism is *Cladosporium carpophilum* Thüm., and it is widely distributed throughout thirty-four States east of the Rocky Mountains, as well as in Europe and South Africa. The author ranks this disease as next in economic importance to brown-rot disease.

The fungus was isolated from peach twigs, fruit, and leaves and grown upon thirty media, and it was found that the optimal temperature for growth was between 20° and 27°, and the maximal temperature about 32° C. Spores readily germinated in sterile distilled water, rain water, and in various nutrient media. Peach trees were repeatedly inoculated from the cultures and produced typical infections. The period of inoculation of the fungus upon the fruit varied from forty-two to seventy-seven days, while upon the twigs and leaves it varied from twenty-five to forty-five days.

The disease is most prevalent in temperate sections where the spring and early summer is moist and the growing season is long. The mid-season varieties and late varieties are most severely affected by the fungus.

The control measures include spraying with self-boiled lime sulphur, or finely divided sulphur, which have proved successful even in severely attacked orchards.

A. B.

Pear, A New. By Albert Barbier (*Jour. Soc. Nat. Hort. Fr.* 4th series, vol. xvii. p. 15, Jan. 1916).—A new pear, 'Arthur Chevreau,' produced by A. Chevreau of Montreuil, is pronounced to be a valuable new winter variety.—*M. L. H.*

Pear and Apple, Leaf Blister of. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 772; April 1916; 4 figs.).—The leaf blister mite (*Eriophyes pyri*) will yield to thorough treatment with kerosene emulsion, miscible oils, or lime-sulphur washes.—*V. G. J.*

Pear Blossoms, A Bacterial Blight of, in South Africa. By E. M. Doidge (*Jour. Appl. Biol.* iv. p. 50, Sept. 1917).—A large percentage of pear flowers in the Stellenbosch district blackened and died during 1914–15. Examination showed the presence of a bacterium which proved a new species, and which, inoculated into the flowers, reproduced the disease. The name *Bacterium nectarophilum* is proposed for the organism, and careful comparisons are made between it, *Bacillus amylovorus*, and the organism which Barker and Grove isolated in England from dying pear flowers (see JOUR. R.H.S. xl. p. 621).

F. J. C.

Pear, Determination of, or Analytical Key of the Fruit.—By Gabriel Luizet (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. p. 75, May 1916).—The Pomological Society of France has been interested for some years in the production of an authoritative key for the identification of individual pears.

M. Chasset Sec. Gen. of the Pom. Soc., has been at work on such a key and has triumphantly brought it to conclusion in the intervals of his military duties since the war. It will not be published until after the war, but the MS. is already in the hands of his colleagues of the Pomological Society. His preliminary draft of the work was shown to the Society at the same time as one worked out independently by M. Jules Jovin and the two were found to differ so little from each other that mutual concessions by the two authors were easily agreed upon, and the result was put forth at Gand in 1913 to serve as the basis of the future analytical key. M. Jovin is at present a prisoner of war in Metz and it is not known whether he has used his enforced leisure upon this work or not, but the Society looks forward hopefully to finding that he has done so when he returns to France. In the meantime M. Chasset's method is as follows:—

Pears are first studied according to their height and width.
1st category. Equal height and width.
2nd category. Wider than high.
3rd category. Higher than wide, 1/10 to 2/10, 3/10 to 4/10.
4th category. Higher than wide, 4/10 and upwards.

The first and second categories forming vol. i. include the following forms—*spheroid, short turbiniform, short doliform, short cydoniform, maliform, flattened turbiniform.* In each of these and the following forms a figure-type of some well-known fruit determines the form to allow whoever has to determine a fruit to compare its silhouette with that of the fruit in question. The third category is included in vols. ii., iii., and iv. and part of vol. v. with the following forms: *doliform, ovoid, turbiniform, truncated turbiniform, piriform, truncated piriform, cydoniform.*

The fourth category finishes vol. v., and includes the last forms adopted—*long piriform, calabassiform, oblong.*

In each of these forms epochs of maturity have been created—June, June–July, July–July, August, &c. Each of these epochs presents a stage when the colour of the skin of the fruit is noted. The colours are dark green, light green, stained with red, ruddy or bronze. Yellow colour, which was originally admitted, was omitted at the last moment as useless for purposes of identification, as it is impossible to fix the exact shade of yellow intended. The colour must therefore be noted when the fruit is gathered, never at complete maturity, when the yellow colour predominates. The peduncle is then considered in its dimensions, long or short; in its consistence, fleshy or not at the base; in its position, straight, oblique, or curved. The flesh of the fruit is examined as to colour, white, yellowish, greenish, salmon-colour; as to flavour, sugary acid, winy, musky, bitter.

For some rare fruits showing identical characters there is a column of observations where the differentiating characters are noted, whether in the tree, the twigs, or the leaves.—*M. L. H.*

Pear, Fungoid Parasite of. By L. Mangin (*Rev. Hort.* vol. lxxxviii. pp. 187–188; 2 figs.).—In the Department of the Indre and Loire, the leaves and branches of the pear trees have been attacked by a new fungus, *Oospora piricola.* The

leaves are covered with grey or white patches, and are brittle and easily broken. The under side is mealy. The presence of slender filaments is easily seen.

S. E. W.

Pear Thrips in California, Life-History and Habits of the. By S. W. Foster and P. R. Jones (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 173; April 1915; 5 plates, 14 figs.).—This minute insect, which until 1904 was unknown to science, is at present one of the most important insect pests with which growers of deciduous fruits in the San Francisco Bay region and adjoining counties have to contend, and each year the insect is developing an ability to subsist on other and new food plants. It has very few natural enemies.—*V. G. J.*

Pear Trees, To make Fertile. By V. Enfer (*Rev. Hort.* vol. lxxxix. pp. 320–321).—To render pear trees fertile it is better to bud the vigorous branches with fruit buds taken from very fertile trees, than to make use of the doubtful expedient of root pruning. This operation should be carried out in August or early September.—*S. E. W.*

Peats and Humus Soils, The Ammoniacal Nitrogen of. By J. C. B. Ellis and C. G. T. Morison (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—In view of the attention now being given to the question of the reclamation of heath and moorland the determination of ammoniacal nitrogen furnishes a figure of some importance. The authors have therefore examined a number of neutral and acid peats from Scotch and Irish deposits. Following Russell's method they distil the peat for some hours, at 40° C., under reduced pressure, with water and magnesium oxide. At the end of about two hours there is a marked drop in the amount of ammonia evolved, and the authors consider that at this stage practically all the ammoniacal nitrogen has been evolved and that more stable nitrogen-containing substances are being attacked. Large quantities of ammonia may be set free in this way, as is shown by the following: NH_3 per cent. in ordinary arable soil ·0003, in neutral peat ·005 (sixteen times as much), in acid peat ·01 (thirty-three times as much). Moreover, much of the ammoniacal nitrogen is in a highly soluble form, for one-half to three-quarters of that evolved by distilling the peat with magnesia can be removed by merely shaking the peat with water.—*J. E. W. E. H.*

Pecan Culture: with Special Reference to Propagation and Varieties. By C. A. Reed (*U.S.A. Dep. Agr., Farm. Bull.* 700, January 18, 1916).—The pecan is found only in certain parts of the United States and Mexico.

The price of nuts is an exceedingly variable factor. A short time ago these nuts were little in use except at holiday times, and the prices to the producer were such that but a small portion of the crop was actually gathered, 3 cents a pound then being considered a fair price.

The increased consumption since that time is largely due to the introduction and use of machines for cracking the nuts, and has caused a rise in price to a maximum of 25 cents a pound for the wild nuts. The average price is probably between 10 and 15 cents a pound.

With reference to the pecan, the term "papershell" has been extended in its application until it is now practically without significance. Originally applied to those types of pecans having such thin shells that one could easily be cracked when two were crushed together in the hand, the term during recent years has been made to include all cultivated varieties; many of them have as hard shells as the average wild nuts. Properly speaking, the term "papershell" never referred to a particular variety; its correct application has been only with reference to varieties having very thin shells.—*A. D. W.*

Permeability of Certain Plant Membranes to Water. By F. E. Denny (*Bot. Gaz.* vol. lxiii. No. 5, May 1917, pp. 373–397; 2 figs.).—In this paper investigations are described which were carried out to measure the rate at which water passes through known areas of certain membranes. Different species of plants and different membranes of the same species showed large differences in the rate of penetration. It was found that the seed coats of peanut and almond showed a difference in permeability to water in opposite directions through the membrane, the faster rate being from the external towards the internal portion of the seed. When solutions of varying concentrations were placed on opposite sides of the membrane, it was found that the relation between rate and concentration difference was complex, and that in general equal osmotic differences do not necessarily produce equal rates; the rate is greatly affected by changes in the concentration of the internal solution: but no mathematical

relation was noted between the concentration on opposite sides and the rate of water movement through the membrane.—*R. J. L.*

Permeability of Membranes as Related to their Composition. By F. E. Denny (*Bot. Gaz.* vol. lxiii. No. 6, June 1917, pp. 468–485; 6 figs.).—The investigations described in this paper were carried out in order to discover what substances in the membrane determine the rate at which water can pass through it. Quantitative measurements showed lipoids, tannins, and pectic substances to be factors in determining the permeability of membranes to water.

Suberized layers were not found to be significant in the membranes studied, and the presence of soluble proteins could not be detected.—*R. J. L.*

Peroxidases, The Mode of Action of Plant. By G. B. Reed (*Bot. Gaz.* vol. lxii. Sept. 1916; 2 figs.).—In a previous paper by the same author on the "Mechanism of Oxidase Action," he has shown that colloidal platinum charged at sufficiently frequent intervals with oxygen will bring about the oxidation of various substances at a rate approximating that affected by hydrogen peroxide and colloidal platinum. From this he concluded that "the action of the colloidal metal in accelerating oxidation by hydrogen peroxide (that is, its peroxidase action) is due to the taking of oxygen from the peroxide by the metal to form a compound which is a more efficient oxidizing agent than the original peroxide."

From these investigations the author has passed to an analogous investigation of the more significant and complicated problem of the nature of peroxidases produced in living tissue, as it seemed probable that the mechanism of the reactions must be similar.

As the result of experiments conducted first with the active ferment of horseradish root, and later with potato peroxidase, the processes were shown to be essentially the same. It is concluded therefore that in oxidation processes catalysed by peroxidases two reactions are involved. Firstly, the peroxidase combines with oxygen from the oxygenases (or from some other source) to form an intermediate compound which is a more energetic oxidizing agent than the original source of the oxygen; secondly, the oxidation is then affected by this intermediate compound.—*R. J. L.*

Phosphates contained in Mineral Phosphates, The Nature of. By G. S. Robertson (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—Various mineral phosphates were finely ground and extracted with 2 per cent. solution of citric acid. The ratio of the phosphoric pentoxide to the calcic oxide in the extract point to formulæ of the type $m\mathrm{Ca_3P_2O_8}$, $n\mathrm{CaO}$. Florida Island phosphate, for example, is represented by $m = 4$, $n = 3$. If the mineral phosphate be calcined before extraction, a citric acid soluble silica phosphate is formed, together with one or more phosphates with a lower lime content than the original phosphate.
J. E. W. E. H.

Phosphates, Manufacture of Acid. By W. H. Waggaman (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 144, December 1914).—A description of the manufacture of acid phosphate; the various processes are well described, and there are some good illustrations of the various types of machinery used.—*C. P. C.*

Phosphoric Acid and Potash: The Production and Fertilizer Value of Citric Soluble. By W. H. Waggaman (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 143, Nov. 1914).—Phosphate rock and felspar are mixed together with a small quantity of iron and manganese to assist fluidity, and heated for twenty minutes to 1400° C.; the resulting product is a fertilizing material containing both phosphate and potash. It not only shows high solubility in citric acid solutions, but is fairly good in water saturated with carbon dioxide.

Pot tests gave good results, although not so high as those obtained by the use of acid phosphate and sulphate of potash, but quite sufficient to indicate a high fertilizing value.—*C. P. C.*

Phosphorus Compounds of the Soil, The Relation between Dilute Acids and the. By E. J. Russell and J. A. Prescott (*Jour. Agr. Sci.* vol. viii. Part 1, Sept. 1916).—It was Daubeny, in 1845, who first used the terms "active" and "dormant" to distinguish soil constituents soluble in dilute acid from those not soluble. Dyer, in 1894, suggested the use of one per cent. citric acid solution to distinguish active and dormant plant food. In Sweden 2 per cent. HCl is used, in Germany a saturated solution of carbonic acid, while aspartic, acetic, and other acids have also been employed. Hall and Amos, Sigmund, and the present authors have at different times in the last ten years endeavoured to ascertain what happens exactly to phosphates contained in soil when the soil

is extracted with successive doses of dilute acid. The amounts of phosphate thus extracted when plotted show that the action is not that which would result were the soil simply a mixture of inert materials including phosphates.

Russell and Prescott in the present paper show that the action between dilute acid and the soil is in two parts, viz. a direct and a reverse action. The direct action results from absorption of P_2O_5 from the soil by the acid: the reverse action results from adsorption of P_2O_5 by the soil from the solution. The amount of P_2O_5 extracted is therefore not "available" phosphate but merely an analytical result. Different acids at equivalent concentrations have much the same direct effect: but the extent of the reverse or adsorptive action varies with different acids, being notably smaller in the case of oxalic and citric acids than with sulphuric, hydrochloric, or nitric acid. Hence the net action of citric acid is due not to greater solvent action, but to greater power of reducing adsorption. The great variations in "available" P_2O_5 as usually determined and the absence of correlation between these analytical results and the crop results are therefore due to variations in the nature of the acid and temperature and other conditions of experiment. On the same type of soil, with the same concentration of one acid and with other conditions the same, comparable results are obtained.

The reverse (adsorptive) action is eliminated by a diffusion method described in the paper.—*J. E. W. E. H.*

Phytophthora Genus, Studies of the. By J. Rosenbaum (*Jour. Agr. Res.* viii. Feb. 1917, pp. 233–276; 7 plates).—No definite criteria for the identification and separation of the various species of *Phytophthora* are known, and the author, with a view of supplying such information, obtained 11 out of the 13 species already described and studied their behaviour from pure cultures on artificial media. He found that the various species react differently on the different media, and made careful measurements of the conidia and chlamydospores, of the various types, the last named being especially useful in delimiting the species. A tentative table for the separation of the species is given, in which the genus is divided into three main groups.

A. *Cactorum Group.* Oogonia with antheridium at side: *P. Cactorum*; *P. Fagi*; *P. Syringae*; *P. Nicotianae.*

A.A. *Phaseoli Group.* Oogonia with antheridium at the base: *P. Phaseoli*; *P. Arecae*; *P. erythroseptica*; *P. parasitica*; *P. infestans.*

A.A.A. *Faberi Group.* Antheridium unknown: *P. Faberi*; *P. Jatrophae.*

Similar tables for the identification and separation of the species of such genera as *Pythium, Peronospora, Plasmopara, Sclerospora,* and *Pythiacystis* are greatly needed.—*A. B.*

Pine Lodgepole in the Rocky Mountains, Utilization and Management of. By D. T. Mason (*U.S.A. Dep. Agr., Bull.* 243, July 12, 1915).—Lodgepole pine (*Pinus contorta*) is the most important timber tree of the Rocky Mountains between Northern Colorado and Central Montana. Once considered almost worthless, it now brings $10 to $100 an acre in National Forest timber sales.

The wood of lodgepole is straight-grained, with narrow rings in which the resinous bands of summer-wood are conspicuous, though relatively small when compared with the spring-wood. It is more resinous than eastern white pine (*Pinus Strobus*), but less so than the yellow pines of south and west. It varies from almost white to light yellow or yellow-brown, with a tinge of red in the heart-wood. Its specific gravity (even dry) is about 0·38, and its weight varies from 25 to 30 lb. a cubic foot.

The wood is fairly soft—about the same as eastern white spruce (*Picea canadensis*)—and is easily worked. Though not so strong as Douglas fir of the Pacific coast (*Pseudotsuga taxifolia*), a heavier wood, tests made by the Forest Service show it to be practically as strong as western yellow pine (*Pinus ponderosa*), and stronger than Engelmann spruce (*Picea Engelmanni*) and Alpine fir (*Abies lasiocarpa*), three woods of more nearly its weight.

Tests made on lodgepole pine and western red cedar (*Thuja plicata*)—telephone poles cut green and seasoned—showed lodgepole pine to be the stronger, both in cross-bending and in compression parallel and perpendicular to the grain. The strength of fire-killed lodgepole pine poles was found to be approximately the same as that of red cedar poles cut green and seasoned.

Lodgepole pine is not durable in contact with the soil, but is easy to treat with preservatives.—*A. D. W.*

Pine Moth, The Zimmermann. By J. Brunner (*U.S.A. Dep. Agr., Bull.* 295, October 28, 1916).—This moth (*Pinipestis zimmermanni*) is very destructive to conifers, and especially to *Pinus ponderosa* in various sections of the west, and *P.*

Strobus, *P. resinosa*, *P. austriaca*, *P. sylvestris*, *P. Cembra*, and other pines in the east. Aside from being largely the cause of "spike-top" in mature timber, it kills outright innumerable trees of the so-called "second growth." The timber of at least one area, thus far discovered, has been brought into such ill-repute that carpenters and builders refuse to use it for anything in which "never-ending shrinkage" is objectionable.

The length of the moth is about one half-inch. The general colour varies from light grey to reddish grey, and the body of specimens having the latter hue on head and thorax is usually dark grey. The underside is uniform grey colour.

The moth attacks mature trees from between 10 to 30 feet from the top down, and second growth from about breast-high up to 35 to 40 feet. Infestation nearer the top or base occurs only to a very limited extent.

In dealing with the pest it is necessary to remove:

(1) Those trees which, below the spike, show branches with yellow needles (a certain indication of present infestation).

(2) Those which are struck by lightning and remain green, as the moth usually breeds in great numbers along the lightning scars; and,

(3) Those which display knobby growths on branches, they being in many localities the most prolific source of replenishment of the moth.—*A. D. W.*

Pinus ponderosa, Western Red-Rot in. By W. H. Long (*U.S.A. Dep. Agr., Bur. Pl. Ind.*, *Bull.* 490, Jan. 1917, pp. 1–8).—The author finds a varying percentage of western yellow pines (*Pinus ponderosa*) affected by a serious heart-rot in Arizona and New Mexico. This disease has three stages—(1) An initial stage, where the heart-wood is firm but shows reddish discolorations; (2) an intermediate stage, where the diseased heart-wood is white and delignified; (3) a final stage, where the heart-wood has disappeared.

The fungus, however, attacks both sap and heart-wood of dead branches, from which it travels down into the heart-wood of the living tree. Although it resembles the red-heart disease (*Trametes Pini*), the author considers it to be a different fungus, with fruiting bodies resembling *Polyporus Ellisianus*.—*A. B.*

Plantations at Corrour, Sir John Stirling-Maxwell's. By H. J. Elwes (*Quart. Jour. of Forestry*, x. pp. 123–128; April 1916).—The Loch Ossian plantations, which extend to 600–700 acres, were intended to improve the landscape and to afford shelter for deer, and were begun twenty-two years ago. They all lie above 1,250 feet, and extend to 1,670 feet around the shores of Loch Ossian, a lonely loch east of the Corrour siding on the West Highland Railway, which skirts the west side of the great Moor of Rannoch. They are fully exposed to the severe gales from the west, but are better sheltered on the north and south by mountains.

The soil is in most places a gravelly glacial drift overlaid by deep peat, with some loamy soil in patches, but little, if any, of it would be considered fit for pasture; and the growth of the trees first planted on the peat was very slow until drains were cut, and the trees planted on the reversed turves taken out of them. Since this has been done a great improvement has taken place, and the younger plantations seem generally more promising than the older ones.

Sir John Maxwell says that *Pinus Cembra*, always rather a slow grower, grows as fast in a poor gravel at 1,400 feet as it does in a lowland garden.

Another pine which has been largely planted at Corrour is the erect Pyrenean variety of *Pinus montana*, of which the seed was specially collected at Mont Louis, and which was expected to produce much better timber than the ordinary Swiss form.

The locality seems too high for the Japanese larch, which seldom ripens its leading shoot: but a few specimens of *Larix occidentalis* were growing very well considering the conditions, better than in Sir Herbert Maxwell's lowland plantations in Wigtownshire.

Several species of spruce have been tried, of which, as far as I could judge, the white American spruce, *Picea alba*, was the most promising. The plants showed a more regular growth with fewer failures than any other tree at Corrour and were quite unhurt by spring frosts in places where the Common and Sitka spruce had suffered severely. Though a tree of the latter has attained 34 feet in height in twenty years, it does not look as though it would become a real timber tree, except in situations where the soil is deep, moist, and good enough to enable it to be closely crowded. The plantation at Durris, which is perhaps the best example in Great Britain of this species, is in close order. *Picea ajanensis*, *P. orientalis*, and *P. nigra*, planted twenty years, have attained 14 to 16 feet in height, but do not look very happy; *P. Omorika* seems so far to grow well,

though the soil and climate are very unlike those of its native country. *Abies nobilis* is quite unhurt by the severest frost, and it is never injured by the heaviest snowfall; but it will never attain much size, though it grows better in the Highlands up to about 1,000 feet than it does in the south at low elevations.—*A. D. W.*

Plant Pathology, Problems of. By F. L. Stevens (*Bot. Gaz.* vol. lxiii. No. 4, April 1917, pp. 297).—The author gives a survey of modern pathological work, and points out the need for a classification of plant diseases which should emphasize the relationships of conditions which it is of service to know. The following suggestions towards such a classification are made:—

I. The parasite living in the sap or in cavities or parts devoid of living protoplasm:

(*a*) Wilt diseases due to mechanical stoppage of vascular bundles by parasites, e.g. *B. solanacearum.*

(*b*) Diseases caused by disintegration of xylem structures, e.g. various wood rots, *Hydnum*, *Fomes*, &c.

II. The parasite for the most part of its life drawing its nutriment from host cells that are still living:

(*a*) Endocellular parasites—the strictest type of parasitism, e.g. *Synchytrium*.

(*b*) Diseases due to parasites which draw their nutriment from living cells by haustoria (endocellular haustorial parasitism), e.g. *Peronospora*, *Cystopus*.

(*c*) Diseases affecting only live epidermal cells (epidermitis), e.g. *Erysiphales*.

(*d*) Diseases in which the parasite grows between the living host-cells; absorption is by the intercellular mycelium (intercellular mycosis), e.g. rusts.

(*e*) Diseases in which the host tissue is displaced or replaced by fungous masses (mycosclerosis), e.g. *Claviceps* and the smuts.

(*f*) The tumor-like diseases, e.g. *Pseudomonas tumefaciens*.

III. The parasite living within host-cells or tissues which have recently been killed or partly disorganized by it:

(*a*) Diseases in which the dominant feature is death of the host-cells before they are actually invaded by the parasite (necrosis). According to the part involved we may recognize:

- (i) Cortical necrosis, in which the cortex chiefly is involved, e.g. *Sphaeropsis*.
- (ii) Parenchymal necrosis, in which the parenchyma, including the greater number of the soft rots, is affected, e.g. *Rhizopus*, *Penicillium*.
- (iii) Macular necrosis, in which necrosis is limited to spots chiefly occurring on leaves. Of this there are two types, according to whether there is abscission or not. Examples of the former are *Cylindrosporium* and *Marssonia*; if the latter, *Pseudopeziza* and *Septoria*.—*R. J. L.*

Plant Peroxidases, The Supposed Action of Potassium Permanganate with. By H. B. Bunzell and H. Hasselbring (*Bot. Gaz.* vol. lxiii. No. 3, March 1917, pp. 225–228).—In the *Bot. Gaz.* vol. lxii. pp. 233–238, Reed describes experiments which he carried out, which led him to conclude that in oxidation processes catalyzed by peroxidases two reactions are involved: first, a combination of the peroxidase with oxygen from substances acting as oxygenases; and second, a transfer of this oxygen to the substance oxidized by means of peroxidases. In this way he believes that the mechanism of oxidation in living tissues could be accounted for. As the result of the investigations of the present writer it seems that in the reduction of potassium permanganate by organic substances in neutral solutions hydrated peroxides of manganese are formed, which are held in solution and which, though they are reductive products of permanganic acid, are still capable of carrying out oxidations. It appears extremely probable that the oxidation phenomena observed by Reed were brought about by such peroxides of manganese and not by activated plant peroxidases. Moreover, since a number of substances acting on potassium permanganate give mixtures which oxidize other compounds, there is no evidence in Reed's experiments that the reduction of the potassium permanganate was brought about by plant peroxidases.—*R. J. L.*

Plants and the Winter. Anon. (*Irish Gard.* xii. pp. 136–141, Sept. 1917).—Very interesting reports containing lists of plants which were killed, injured, or remained uninjured after the severe winter of 1916.—*E. T. E.*

Polyporus Schweinitzii. By J. M. Murray (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 56–57, January 1916).—This fungus has been known on the Continent for many years as an enemy of Scots pine, Weymouth pine, and larch, but has not been considered a serious enemy. In the United States it is common through-

out the northern forests of spruce and fir, and is said to be one of the most destructive of Polypori. There, it is recorded as attacking the white and red spruces, Balsam firs, Thujas, and Weymouth pine. In Britain *P. Schweinitzii* has hitherto been regarded as a rare species. It seems to be becoming much more common, however, and may yet have to be regarded as a great danger to coniferous forests. It attacks Douglas fir and Sitka spruce in Perthshire, and Scots pine in Midlothian, as well as larch in England.

Evidently the fungus first attacks the roots and then gradually works upwards into the trunk. There it spreads, causing decay in the stem up to a height of 40 to 50 feet.

The rate at which the fungus progresses seems to be variable. About six years ago a large Sitka spruce first produces sporophores at a few feet from the base of the trunk. To outward appearance the tree remained healthy till it was broken over by wind two years ago. The outer wood, to about 6 to 8 inches in width, was then found to be the only sound part in a butt 3 feet in diameter at breast-height. About 18 feet of the stem showed more or less distinct rings of rot.

The following remedial and preventive measures might be suggested:

(1) Cut off affected roots well above the place where the last sign of rot appears, and tar the wound.

(2) Collect and burn sporophores while young.

(3) Cut out badly attacked trees and plant hard woods in their places.

A. D. W.

Potassium Cyanide and Ether, Similarity in the Effects of. By W. J. V. Osterhout (*Bot. Gaz.* vol. lxiii. No. 1, Jan. 1917, pp. 77–80; with 1 fig.).—In common with such typical anaesthetics as ether and chloroform, potassium cyanide produces a temporary decrease in permeability. The author suggests that this does not show that anaesthesia is a form of asphyxiation, but that it is more probable that the effect produced by KCN is the result of its inhibiting effect on oxidation.—*R. J. L.*

Potato Scab and Sulphur Disinfection. By C. D. Sherbakoff (*U.S.A. Dep. Agr., Cornell, Bull.* 350, Aug. 1914, pp. 709–743; 2 figs.).—Potato scab is widely distributed, and is characterized by roughened spots which may form deep pits in the outer skin of the tubers. The disease is due to the fungus *Actinomyces scabies* (Thaxter) Güssow.

From the experiments, the author finds that if 450 to 900 lb. of flowers of sulphur to the acre are broadcast on land, scab is considerably reduced.

If, however, lime and sulphur are added together in equal proportions the fungicidal power is reduced to nil, but if 400 lb. of lime are mixed with 900 lb. of sulphur to the acre and placed on land, the fungicidal power is not diminished and the crop is considerably improved. It is noticed that sulphur added to the fertilizer reduces its value.—*A. B.*

Potato Seed for Northern Nebraska. By R. A. Emerson (*U.S.A. Exp. Sta. Nebraska, Bull.* 146, Dec. 1914).—It is suggested that the ideal potato for any district or set of conditions is probably best produced in that district or under those conditions. In East and South Nebraska, however, it has been found that the stock deteriorates so rapidly that fresh seed has to be imported every two or three years, and any long series of breeding operations has been impossible. The Nebraska Experiment Station, however, does not consider this state of things inevitable. Two methods of managing a crop—by frequent surface tillage in the usual way and by treating with a mulch—were tried, and an elaborate series of tests and cross-tests clearly brought out that the mulching system was most suited to that region. It is hoped in time to produce a strain of potato hardy enough for the severe Nebraska conditions by this method.

The mulch should be about four inches deep after settling, and may consist of hay, straw, stable litter, or other coarse material free from grain and noxious weed seeds.

It must be remembered that these experiments were designed, not to test the effect on the growing crop, but to discover the best method of producing a good strain of seed.

Each experiment, therefore, took two years to complete.—*M. L. H.*

Potato, Spongospora subterranea and Phoma tuberosa on the Irish. By L. E. Melhus, J. Rosenbaum, and E. S. Schultz (*U.S.A. Jour. Agr. Res.* vol. vii.

No. 5, Oct. 1916, pp. 213–254; 1 fig., 11 plates).—The following summary of this work is given :—

1. *Spongospora subterranea* exists in six different potato-growing districts in the United States.

2. Periods of damp, rainy, and cloudy weather favour the development of the fungus. Infection develops earlier on roots than on the tubers.

3. The authors consider that cultural practices and soil water are important agents in spreading the disease.

4. The fungus attacks seven other solanaceous hosts, including the tomato, besides the potato. The disease forms large galls on the roots of such hosts, and these galls have many points in common with the *Plasmodiophora Brassiceae* on the cabbage.

5. The absence of the canker stage may be due to the short growing period afforded the potato crop in the infected districts of the United States.

6. Amongst the saprophytic fungi found associated with *S. subterranea* is a species of *Papulospora*, which may be easily confused with the first fungus because of similarity in shape of spore balls.

7. There is a close relation between certain soil types and the development of the fungus. From the type of soil and its drainage, it is possible to predict what the development of the disease will be in any particular field.

8. The dry-rot due to *Phoma* is the most serious of the rots. The species described is given the name of *Phoma tuberosa*, n. sp.

A short bibliography is appended.—*A. B.*

Potato, Tuber-Rot and Wilt of. A Physiological Study of Two Strains of Fusarium in their Causal Relation to Tuber Rot and Wilt of Potato. By George K. K. Link (*Bot. Gaz.* vol. lxii. Sept. 1916; 13 figs.).—As the result of his investigations the author concludes :

1. That both *Fusarium oxysporum* and *F. trichothecioides* (*F. tuberivorum* of Wilcox and Link) can produce both tuber rot and wilt of the potato plant.

2. The wilt is induced by destruction of the root system and by clogging of the wood-vessels of the stem, and is, in mild cases, marked by such symptoms as discoloration of leaves, curling and rolling of leaves, and production of aerial tubers.

3. Under field and storage conditions *F. oxysporum* is more probably responsible for wilt than is *F. trichothecioides*, and the latter more responsible for tuber rotting.

4. The optimum and maximum temperatures of *F. oxysporum* are higher than those of *F. trichothecioides*. The former has a more rapid, superficial, and spreading habit of growth than the latter.

5. Both organisms possess a striking ability to use the most diverse carbon material as carbon sources in their metabolism.—*R. J. L.*

Potato, Weight of Seed per Acre. By J. T. Ramsay (*Jour. Agr. Vict.* Oct. 1917, p. 592).—For general practice the Department of Agriculture recommends 27 inches between the rows, about 15 inches between the sets, with sets of an average weight of 2 oz. Approximately 17 cwt. of seed are required for an acre. Experience shows that fairly heavy seeding and liberal manuring is sound business policy.—*C. H. H.*

Potatos, Some Degenerate Strains of. By F. C. Stewart (*U.S.A. Exp. Stn., New York, Bull.* 422, July 1916, pp. 318–357; 12 plates).—The conclusions reached were that leaf-roll, curly-dwarf, and mosaic are closely related disorders, due to the same general undetermined cause. All are transmitted through the seed tubers, so that the progeny are similarly affected.

There is no evidence that any of the above forms of degeneration are communicable from one plant to another, except through the seed tubers. They are not due to any parasitic organism, nor can unfavourable soil or weather conditions be responsible.

Neither normal foliage nor high yield is a guarantee of productivity in progeny the following season. Degeneration may occur quite suddenly. It is unsafe to select seed potatos from fields containing many degenerate plants. Even the normal plants from such fields may produce worthless progeny. It is doubtful if any method of seed selection will prevent the "running out" of seed potatos under certain conditions.—*A. B.*

Primula sinopurpurea. By B. (*Irish Gard.* xii. June 1917, p. 88).—A useful but brief description of a desirable new species.—*E. T. E.*

Prunus Pseudo-cerasus. By R. I. Lynch (*Gard. Chron.* Aug. 4, 1917, p. 47; with 4 figs.).—A critical note on apparently the only tree of this species in cultivation in Britain. Reference is made to Lindley's type specimens in the Cambridge Herbarium in comparison with *P. serrulata*.—*E. A. B.*

Puccinia graminis, Biological Forms of. By E. C. Stakman and F. J. Piemeisel (*Jour. Agr. Res.* x. pp. 429–495, Aug. 1917; 7 plates).—*Puccinia graminis* has been found upon thirty-five species of grasses in various parts of the United States. The authors have isolated the following biological forms from thirty grasses: *Puccinia graminis tritici*, *P. graminis tritici compacti*, *P. graminis secalis*, *P. graminis avenae*, *P. graminis phleipratensis*, *P. graminis agrostis*. More than one biological form may occur on the same host in nature, sometimes even on the same plant. On the basis of parasitism the biological forms may be divided into two groups, the first three forming group I.; the other three, group II.

The differential hosts for group I. are wheat, club wheat, rye, and *Agropyron repens*, while the differential hosts for group II. are oat, *Phleum pratense*, and *Agrostis* spp.

Barley, rye, and *Bromus tectorum* have been infected by all six biological forms. These forms may be distinguished morphologically as well as parasitically. The size, shape, and colour of the uredospores are the distinguishing characters. The rate of development of a given biological form depends upon the vigour of the rust strain, the kind and the age of the host plant, as well as external conditions of light, heat, and moisture. Sunlight, high relative humidity and moderate temperatures up to about 75° F. are most favourable to rust development.

A short bibliography is appended.—*A. B.*

Pueraria Thunbergiana. (*Le Jard.* vol. xxxi. p. 140; 1 fig.)—*Pueraria Thunbergiana*, the Kuzu or Kuza of Japan is a hardy and vigorous climber with handsome foliage and enormous tubers. It is valuable as forage, as a source of textile fibre and also of flour from its tubers.—*S. E. W.*

Quassin as a Contact Insecticide. By W. B. Parker (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 165, December 1914).—It has been supposed by many horticulturists that quassia owes its effectiveness as an aphicide entirely to the extreme bitterness it imparts to the sprayed plants, making them thereby distasteful to the pests. This undoubtedly plays a great part in its effectiveness, but the author has amply proved that Quassin, the active principle of quassia chips, is a powerful insecticide itself, even when compared with nicotine sulphate.

Methods of extraction are given, also experimental results in the field.

C. P. C.

Radioactive Substances as Fertilizers, Use of. By W. H. Ross (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 149, December 1914).—The results given in the above bulletin do not encourage the use of radioactive substances for general farm use. In fact, there is evidence given to prove that the increases shown in some cases are due to the uranium contents, as the amount of radioactive substances in experimental fertilizer was actually less than that present in normal soils.

It is thought, however, that when properly carried out, in greenhouse or other work where the great expense is justified, beneficial results may be obtained by the use of radioactive substances.

It is found that nitrogen-fixing bacteria (*Azotobacter chroococcum*) were strongly stimulated in gelatine cultures, by passing air containing radium emanations over them.

Under like conditions the period for the germination of seeds was shortened, and an increase of development in plant growth shown when watered by radioactive water.—*C. P. C.*

Rainwater, Dissolved Oxygen in. By E. H. Richards (*Jour. Agr. Sci.* viii. June 1917).—The amount of oxygen carried into the soil as gas dissolved in rainwater is of considerable interest, since oxygen is essential for root aeration, and the oxygen dissolved in rainwater is also one of the chief factors controlling the activity of soil bacteria. The author has made a large number of analyses of rainwater by Winkler's method, and finds that it is very nearly saturated with oxygen when the temperature of collection is below 5° C., as is the case for about nine months in the year in this country. For temperatures above 5° C. the dissolved oxygen may fall as much as 25 per cent. below the saturation point.

J. E. W. E. H.

Raisin Industry, The. By George C. Husmann (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 349, Washington, March 1916; figs.).—An account of the origin and growth and of the present condition of the raisin-growing industry in California. The first introduction of raisin grapes into California was in 1851. The industry has fluctuated in importance and profitableness, but is firmly established, and California now produces three times as many raisins as Spain. The requirements of the home market are already supplied, and if the demand became greater it would be quite easy enormously to increase the production.

The bulletin describes the methods of culture and of drying, and gives exact descriptions of the varieties grown. So far the currant grape has only been planted in small quantities, but efforts are being made to encourage this branch of the industry also.—*M. L. H.*

Rhododendron sphaeranthum (*Irish Gard.* xii. p. 133, Sept. 1917).—A new and interesting Chinese shrub collected by George Forrest in the mountains west of the Fengken Valley, in June 1914, at an altitude of twelve to thirteen thousand feet.—*E. T. E.*

Ringing, Effect of, on Movement of Sugar, &c. By Shin-ichi Hibino (*Jour. Coll. Sci. Tokyo*, xxxix. pt. 5, March 1917; plates).—Unfortunately in German, this well-illustrated article is of considerable horticultural value. Leaves on portions of stems ringed by removal of bark showed abnormal development of anthocyanin both above and below the ringing, and other differences in rate of development and size of leaves were noted. Careful comparisons of the extent of development of callus and so on, as well as rate of thickening above and below the ring, and quantity of reserve material in stem and leaf above and below are also made.—*F. J. C.*

Rosa, Imperfection of Pollen and Mutability in the Genus. By Ruth D. Cole (*Bot. Gaz.* vol. lxiii. No. 2, Feb. 1917; pp. 110).—The examination of a large number of species of *Rosa* has shown a great amount of abortive pollen, and also great variability in the genus. Both of these factors point to the species as being largely of hybrid origin. The writer concludes that "the mutability of the species of *Rosa* cannot properly be used in support of the mutation hypothesis, since this phenomenon is obviously the result of hybrid contamination in nature."—*R. J. L.*

Rose, Bacterial Disease of. By E. E. Pescott (*Jour. Agr. Vict.* Dec. 1916, p. 767).—In the case of a new disease in roses, in which the young shoots and leaves shrivel, turn black, and die, followed by death of main shoot, and lastly the whole plants, it is found that painting the stems of affected plants with permanganate of potash (half ounce to gallon water) has resulted in good recovery. Three or four applications are necessary at intervals of about a fortnight; avoid letting the solution drop on the foliage more than is unavoidable.—*C. H. H.*

Rose Chafer, The, a Destructive Garden and Greenhouse Pest. By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 721; April 1916; 4 figs.).—The rose and grape vine are the greatest sufferers from attacks by this insect; but it is also very destructive to fruit, shade, and other trees and shrubs. In times of great abundance these insects completely destroy flowers, peas, beans, and nearly all garden fruits and vegetables, corn, wheat, and grasses. They consume alike blossoms, leaves, and fruit.

It is one of the most difficult insects to control successfully, and a thoroughly effective remedy has yet to be discovered.—*V. G. J.*

San Jose Scale, Observations and Experiments on the. By Stephen A. Forbes (*U.S.A. Exp. Stn., Ill., Bull.* 180; March 1915; 3 figs.).—Experiments with infested ripe apples show that the San Jose scale may live and reproduce freely on such fruits plucked from the tree and kept at ordinary room temperatures, and that living young may continue to be born under such conditions during a period of eight weeks. Infested apples taken from cold storage in December gave similar results, young being produced on these apples for twenty-five days.—*V. G. J.*

Scots Pine, Some Observations on the Entomology of the. By J. W. Munro (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 114–122; July 1916).—Of all our Scottish timber trees the Scots pine probably supports the largest number of insects. This is not surprising when we consider that it has been for long the chief timber tree. It is, moreover, an indigenous species. Of the Coleoptera it

supports twenty species belonging to eleven genera. Many of these beetles are to be found only on the Scots pine, and others of them prefer it to their other hosts, such as spruce.—*A. D. W.*

Seed Production of Western White Pine. By Raphael Zon (*U.S.A. Dep. Agr., Bull.* 210, April 17, 1915).—The age of the trees evidently has an effect upon the amount and quality of seed produced. Thus the younger trees, ranging from 72 to 100 years of age, have produced a larger quantity of germinable seed than the older trees.

The relation between the length of the cone and the size of the seed (the number of seeds in a pound) is clearly shown. Thus the longest cones, 8 inches and over, yielded about 22,000 seeds to the pound, while cones 5 inches long occasionally yielded as many as 57,000 seeds to the pound.

The vigour of growth apparently influences favourably the amount and quality of seed produced.

While a relation between the size of the seed and its germinative vigour is not clearly brought out, yet there seems to be a tendency for the larger seeds to have the highest germinative vigour.—*A. D. W.*

Seeds, Temperature and Life Duration of. By James F. Groves (*Bot. Gaz.* vol. lxiii. No. 3, March 1917, pp. 169–187).—The investigations described were carried out with the idea of seeking to determine "the extent to which a study of the laws of the life duration of seeds at high temperatures (50°–100° C.) will explain the process of degeneration of air-dried seeds at ordinary storage temperatures." The experimental results obtained makes possible a quantitative statement of the significance of various storage conditions, especially moisture content and temperature upon the longevity of seeds.—*R. J. L.*

Shortleaf Pine: Its Economic Importance and Forest Management. By W. R. Mattoon (*U.S.A. Dep. Agr., Bull.* 308, November 22, 1916).—Shortleaf pine is admirably adapted to pure plantations, which are strongly recommended over any kind of mixture in starting young forest stands. Shortleaf may, however, be planted in mixture with heavier-foliaged species of slower growth—for example, sugar maple and such durable and valuable wood as red juniper. The red pine and western yellow pine are not successful in mixture with shortleaf, because of the attacks of *Aecidium Pini*, a rust fungus. Pure plantations of shortleaf promise larger financial returns than any other form. Mixed stands afford better protection against large losses from disease and insect ravages, as well as a variety of wood for use on the farm and to supply markets which may offer better returns for such sales.—*A. D. W.*

Soil Bacteria, Influence of Barnyard Manure on. By J. E. Greaves and E. G. Carter (*Jour. Agr. Res.* vi. pp. 889–926; Sept. 1916).—The authors found that the quantity of manure, and of water, and the cropping influenced the bacterial content of the soil. In the particular calcareous soil experimented with, the application of five to fifteen tons of manure increased both the ammonifying and the nitrifying powers of the soil, as did the application of thirty inches of irrigation water. Forty inches of water, however, reduced the ammonifying powers. A direct relationship was found between the number of bacteria, the ammonifying and nitrifying power, and the crop production on soil receiving no manure, five tons, and fifteen tons an acre, while the bacterial activities of soil receiving varying amounts of water were closely correlated with the crop produced. The ammonifying and nitrifying powers of fallow soils were slightly higher than those of cropped soils.—*F. J. C.*

Soil Bacteria, The Influence of Crop, Season, and Water on. By J. E. Greaves, R. Stewart, and C. T. Hirst (*Jour. Agr. Res.* ix. May 1917, pp. 293–341).—It is of the utmost importance that the quality and quantity of plant food rendered available during the season should balance that required by the growing plant, so that the maximum yield may be obtained with the minimum loss of soil fertility. Most of the changes which take place in the soil are due to bacteria, and the speed with which these changes occur is governed, amongst other factors, by the season of the year, the crop, and the water in the soil.

The authors, after reviewing concisely the previous work done by other investigators on the influence of moisture, the influence of the crop, and the influence of the season, and after numerous experiments, arrived at the following conclusions:—

The quantity of nitric nitrogen in the surface 6 feet of alfalfa soil is low throughout the season, but higher in the autumn than in the spring or summer.

The amount decreases as the water increases. The quantity of nitric nitrogen in the surface 6 ft. of potato, oats, corn, and fallow soil decreases as the water increases; but the quantity formed for each is greatest where the largest quantity of water was applied. Large quantities of nitric nitrogen disappear from fallow soil during the summer months, due to bacteria growth which converts it into protein substances, and not to denitrification. The use of irrigation water increases the bacterial activities of the soil, which render soluble the nitrogen, and where excessive amounts of water are used this soluble nitrogen is lost.

A fairly complete bibliography is appended.—*A. B.*

Soil, Effect of Decomposing Organic Matter on the Solubility of certain Inorganic Constituents of the. By Chas. A. Jensen (*Jour. Agr. Res.* vol. ix. No. 8, May 1917, pp. 253–268).—In Southern California many Citrus groves are largely mulched by stable manure, hay, clover, and alfalfa. These substances soon begin to decompose when exposed to rain, and their decomposition products leach into the soil. On certain soils much benefit follows such mulching, especially from the clover and alfalfa straws. It was found that the solubility of calcium, magnesium, iron, and phosphoric acid in Citrus soils was measurably increased by green manure, stable manure, and their extracts, and this was held to be due partly to the action of the inorganic salts contained in the organic substances and partly to the solvent action of the soluble organic compounds formed during decomposition.—*A. B.*

Soil, Factors affecting the Evaporation of Moisture from. By F. S. Harris and J. S. Robinson (*Jour. Agr. Res.* vii. pp. 439–461, Dec. 1916).—The authors investigated some of the factors promoting evaporation from soils, and found the rate of evaporation from a moist soil to be very rapidly decreased as the humidity of the air increased; air currents up to a certain velocity increase the rate of evaporation; evaporation is higher from finer than from coarser saturated soils; reduction of intensity of sunshine greatly reduces rate of evaporation (but it is not clear whether temperature is taken into account); slight changes in temperature have a marked effect on evaporation; a thin dry mulch, especially if composed of coarse particles, which are more effective than fine, materially reduces evaporation; compacting the surface increases evaporation, and high concentrations of dissolved salts reduce it.—*F. J. C.*

Soil, Measurement of Inactive Moisture in, by the Dilatometer. By George Bouyoucos (*Jour. Agr. Res.* viii. Feb. 1917, pp. 195–217; 1 fig.).—The principle of the dilatometer is based upon the fact that water expands when freezing. If the amount of expansion that a given quantity of water produces upon freezing is known, the total amount of water that freezes in a soil can be calculated. The dilatometer consists of a bulb, a thermometer, and a measuring stem. The method consists of mixing soil and water in certain definite proportions in the bulb and then filling with ligroin. The apparatus is cooled, and the total rise of the ligroin in the stem is taken to represent the total quantity of water that freezes in the soil.—*A. B.*

Soil Nitrates, Effects of Water and Manures on. By F. S. Harris and N. L. Butt (*Jour. Agri. Res.* viii. Feb. 1917, pp. 333–359; 18 figs.).—The authors find that with a sod soil kept in the laboratory for two and a half years, the total salts and nitrates accumulated most rapidly with a moisture content of 23 per cent. to 28 per cent. Cropped and uncropped soil kept in large tanks under controlled moisture conditions showed a decrease in nitrates and total soluble salts as the percentage of moisture increased, the nitrates being very low in water-logged soil. Under field conditions more nitrates were found in both cropped and uncropped (fallow) soils during the summer than just after the corn crop had been harvested. Large irrigations decreased the soluble salts in cropped soils more rapidly that it did in fallow soils; and irrigation or manuring affected the nitrates relatively more than the total salts. It was also found that in unmanured soil the nitrate content was about twice as great with a fallow as with a crop, and in manured soil it was about three times as great. The ratio of total soluble salts to sodium nitrate in a cropped soil was 24·5 to 1 without irrigation; and 37·5 to 1 with 40 inches of water, while in a fallow soil the ratio was 8·9 to 1 without irrigation and 16·2 to 1 with 40 inches of water.

A short bibliography is appended.—*A. B.*

Soil Nitrogen and Nutrition of Citrus Plants. By J. G. McBeth (*Jour. Agr. Res.* ix. May 1917, pp. 183–252; 18 figs.).—The total nitrogen content of Citrus lands is often low and this deficiency must be made good by fertilizers,

manures, &c. The author finds that semi-arid soils frequently fail to nitrify dried blood when added in 1 per cent. amounts, but can nitrify blood if added in amounts not greater than is ordinarily applied under field conditions. Green manures, especially the legumes, nitrify very rapidly. Fifty per cent. of the nitrogen contained in green plant tissues may be converted into nitrates in thirty days, while, of course, such manures furnish a valuable source of energy for the non-symbiotic nitrogen-fixing organisms. As much nitric nitrogen is lost from Citrus soils by leaching, the growing of a winter cover crop is suggested as a most effective means of preventing this loss. The prevalent system of furrow irrigation causes a very unequal distribution of the soil nitrates, forming brown "nitre" spots, which sometimes contain 1 per cent. N as nitrates. These "nitre" spots consist largely of the deliquescent calcium nitrate. The author holds that basin or overhead irrigation is more satisfactory in promoting the more equal distribution of soil nitrates than furrow irrigation.

A short bibliography is appended.—*A. B.*

Soils Arid and Humid, Comparison of the Nitrifying Powers of. By C. B. Lipman, P. S. Burgess, and M. A. Klein (*U.S.A. Jour. Agr. Res.* vol. vii. No. 2, Oct. 1916, pp. 47–82).—A study of the nitrifying powers of some 40 humid and 150 arid soils obtained from the various State experimental stations showed the following results:

The nitrifying powers of humid soils are greater than those of arid soils with regard to soil nitrogen and dried blood nitrogen. Arid soils, however, nitrify sulphate of ammonia and cotton-seed meal with much greater vigour than do humid soils.—*A. B.*

Soils, Availability of Potash in certain Orthoclase-bearing, as affected by Lime or Gypsum. By L. J. Briggs and J. F. Breazeale (*Jour. Agr. Res.* viii. Jan. 1917, pp. 21–28).—It is thought that the application of lime to a soil liberates potash from the soil minerals. The point is of importance to the Citrus industry of Southern California, where heavy applications of lime and gypsum are sometimes made.

Samples of pegmatite and orthoclase, as representative of the potash-bearing rock and mineral from which much of the Citrus soils are derived were finely ground and shaken for a number of days with aqueous solution of calcium hydroxide and calcium sulphate in various strengths. The calcium hydrate solutions did not modify the solubility of potash in either the pegmatite or orthoclase, while the gypsum solution depressed the solubility of potassium in the orthoclase as the strength of the gypsum increased.

It was found that similar results followed the addition of gypsum in a Citrus soil which was under cultivation as well as in virgin soils. The experiments tend to show that the availability of potash to plants in soils of an orthoclase nature is not increased by the addition of lime or gypsum, but rather a depression in the solubility of potash occurs under such conditions.—*A. B.*

Soils, Calcium Compounds in. By E. C. Shorey, W. H. Fry, and W. Hazen (*Jour. Agr. Res.* viii. Jan. 1917, pp. 57–77).—In this paper are given analyses of sixty-three samples of soils from nineteen different States. The quantities of calcium carbonate, calcium sulphate, calcium combined with humus compounds, and calcium silicates have in all cases been accurately determined. The figures obtained showed a wide variation in the total calcium content and in the content of $CaCO_3$ and the two classes of silicates. Calcium combined with humus was present in thirty-four of the samples only. No relation was apparent between the total calcium content and the quantity of any of the classes of calcium compounds. It was found that it is possible to have two soils with the same calcium content but with the kinds of calcium compounds present in quite different quantities. A good alfalfa soil is characterized by a high calcium content, but low in content of calcium carbonate.—*A. B.*

Soils, Fixation of Ammonia in. By J. G. McBeth (*Jour. Agr. Res.* ix. April 1917, pp. 141–155).—The author points out that the capacity of a soil to serve as a source of plant food depends upon its power to retain water-soluble substances, like potash, phosphoric acid, and ammonia, against the leaching action of rains. He finds that many semi-arid subsoils have the power of fixing ammonia in large quantities, and much of this ammonia cannot be removed by the ordinary methods of analysis. If the soil is treated with 10 per cent. HCl the amount of ammonia extracted is the same as when the soil is treated and distilled with MgO. Anions have little or no influence on ammonia-fixation in soils. The amount of fixation is increased with rise in temperature, the fixation being

most rapid during the first few minutes, though the process appears to continue for several days. Heating a soil for six hours at a temperature of 200° C. and over reduces its power of ammonia-fixation. Aluminium, iron, and potassium salts added to soils prior to the addition of ammonia reduce the ammonia-fixing power of the soils to a marked degree, while calcium, magnesium, and sodium salts have little effect on this power in semi-arid soils.—*A. B.*

Soils of the Southern Island of New Zealand, with Special Reference to their Lime Requirements. By Leonard John Wild (*Jour. Agr. Sci.* viii. 2, pp. 154–177; March 1917).—This work was undertaken by the author with a view to testing the applicability of Hutchinson and MacLennan's method (*Jour. Agr. Sci.* March 1915) to New Zealand soils. The essence of this method is the treatment of a known weight of soil with a known volume of calcic bicarbonate of known strength, afterwards determining by titration with standard acid the loss of lime suffered by the solution. This loss is deemed to be the lime requirement of the soil. Hutchinson and MacLennan state, with reference to barley plots at Woburn, that in all cases where the soil is neutral in reaction high returns are obtained, but where the lime requirement is more than 18 per cent. (corresponding to 1 ton of quicklime to the acre) the crop shows almost if not complete failure.

The New Zealand work does not accord with the Woburn experience. In his experiments the author did not obtain concordant results, the difference in indicated "lime requirement" of the same soil being as much as 25 per cent., and one soil which contained so much as 10 per cent. of calcic carbonate yet indicated a small lime requirement. Further experiments on washed sand, a limestone soil, samples of soil already presumably saturated by the bicarbonate solution, and finally on the bicarbonate solution itself, suggested that calcic bicarbonate solution might undergo change, but whether chemical or physical the author has not ascertained.

Tests were next made of the time necessary for the completion of the reaction, and of the effect of using solutions of bicarbonate of varying strengths. Hutchinson and MacLennan recommended a strength of about $\frac{N}{50}$ and a period of four hours. Broadly speaking, the author agrees that these will generally give satisfactory results from a practical standpoint, but adds that the position from a theoretical standpoint is unsatisfactory since his experiments indicate that the "lime requirement" is not constant, but varies directly as the concentration of the bicarbonate solution. Field experiments also afford discrepant results: some New Zealand soils possessing an indicated acidity of less than 0·1 per cent. nevertheless are known to demand lime and cannot be farmed without lime dressings. Other soils possessing a decided acid reaction will yet give good crop returns without liming.—*J. E. W. E. H.*

Soils, Semi-arid, Nitrification in. By W. P. Kelley (*U.S.A. Jour. Agr. Res.* vol. vii. No. 10, Dec. 1916, pp. 417–438).—In these experiments the author shows the amount of nitrate formed from dried blood, bone meal, and ammonium sulphate varied greatly during four weeks' incubation when different concentrations were employed. This is true in regard both to the absolute amount of nitrate formed and the percentage of nitrogen added that was nitrified.

When 1 per cent. of dried blood was used, the nitrifying activity was feeble or even negative in certain soils in which 1 per cent. of bone-meal, and ·2 to ·3 per cent. of ammonium sulphate underwent active nitrification. However, when low concentrations of dried blood were employed, active nitrification took place in every case, and when equal amounts of actual nitrogen were added the yields of nitrates were similar, whether it was derived from dried blood, bone-meal, or ammonium sulphate.

It was found that high concentrations of bone-meal with a nitrogen content were highly toxic to nitrification, very much as was the case with 1 per cent. dried blood.

The inability to nitrify 1 per cent. of dried blood was not confined to any one type of soil, or to soils low in organic matter, as many varying types of soil were employed from different localities in Southern California.—*A. B.*

Soils, The Shrinkage of. By H. A. Tempany (*Jour. Agr. Sci.* viii. June 1917).—Observations by previous experimenters on thirty-four different types of soils in St. Lucia and Dominica had established the fact of the correlation between the shrinkage of the soils when dried and their suitability for growing cacao. A linear shrinkage (as determined by measuring the distances between marks on soil blocks at different stages of dryness) of 10 per cent. or more in

surface soil indicates unsuitability for cacao growing. The limits of shrinkage range from 2 per cent. in an open sandy soil to 16 per cent. in an exceptionally heavy clay.

The author has made corresponding and further investigations of soils in the Leeward Islands. He attributes shrinkage to the action of a gel. At the point of maximum plasticity all the water present in the experimental blocks of soil is probably in union with the colloid matter present as a gel occupying the whole of the interstitial spaces of the soil and forming a network which, as water is lost, draws the soil particles together. The cubical contraction observed is equal to the volume of water evaporated from the block until the point is reached where internal friction begins to exert an influence. Further, the author finds that there is a roughly constant ratio between the percentage of soil particles less than 0·01 mm. in diameter and the percentage linear shrinkage.

Pore space is related to linear shrinkage, and is determined by measuring the true density (D_1) of the soil, and the apparent density D_2. The pore space (P) is then given as a percentage by $P = \frac{D_1 - D_2}{D_1} \times 100$. D_2 is determined by weighing blocks of soil coated with a thin layer of wax of known specific gravity. When the percentage pore space is plotted on the x-axis against linear shrinkage (L) on the y-axis a straight line curve is obtained, of which the extreme points are given by $L = 1$, $P = 27·7$ and $L = 13$, $P = 12·5$. If this straight line is continued both ways it cuts the axes at $x = 28$ and $y = 23·5$. It is known that the figure 28 approximates to that of the pore space found to exist in uncontracted coarse sand of uniform texture. What is the significance of the figure 23·5? It is the point where the linear shrinkage is 23·5 per cent. and the pore space zero. That is, it is a limit representing an imaginary soil entirely composed of pure dry colloidal clay, the dimensions of whose colloidal particles approach to the molecular order of magnitude. Since the distance through which the curve is extrapolated is considerable, the above figure can only be accepted as moderately approximate; the curve does nevertheless enable us to calculate, to the same degree of approximation, the true colloidal content of a soil from a measurement of its percentage linear shrinkage, and thus to measure easily what it has not been possible hitherto to measure with any accuracy even by the best methods of physical analysis. Full experimental details with illustrations of the apparatus employed are given in the paper.

J. E. W. E. H.

Spruce and Balsam Fir Trees of the Rocky Mountain Region. By George B. Sudworth (*U.S.A. Dep. Agr.*, *Bull.* 327, Feb. 19, 1916).—The spruces are important forest trees, and some are much planted for ornament. They yield superior saw timber, the straight and even-grained wood being used for a great many commercial purposes, including paper pulp, for which it is unsurpassed.

Seven species are indigenous to North America, and all occur within the United States. Four species occur over the western half of the United States, and three through the north-eastern States and Canada, two extending from the Great Lake region into Alaska.

Black spruce is mainly an eastern and far northern species, but occurring in the Canadian Rocky Mountain region. There it is from 25 to 40 feet high and from 4 to 8 inches in diameter. In its wider eastern range this tree exceptionally attains a height of from 50 to 75 feet and a diameter of about 1 foot; very occasionally it grows to 100 feet in height and 2 to 3 feet in diameter.

White spruce has its main range in north-eastern United States and Canada. It varies in height, according to situation, from 15 to 75 feet and in diameter from 12 to 20 inches. The largest trees occur in the East, where the height is from 80 to 100 feet or more and the diameter from 24 to 36 inches. Trees 3 or 4 feet in diameter and over 100 feet are rather rare.

Engelmann—*Picea Engelmanni*—is known to lumber men mostly as 'spruce,' while some call it 'white spruce,' probably because of its resemblance to the true white spruce (*P. canadensis*), with which they may have become acquainted in the East. It is, however, commonly known to foresters and botanists as Engelmann spruce, a name which it is hoped may be generally adopted, both because of its distinctness and the fact also that it commemorates the name of one of the ablest students of western trees. It is cut extensively for lumber, which is used for general construction and to some extent locally for interior finish. The timber is also much used for temporary or light traffic ties, telephone and telegraph poles, mine props, fuel, house logs, and corral poles.

Abies balsamea (Linn.) Miller is found only within the Canadian Rocky Mountain region. It extends southwards into the United States only from the

Great Lakes and North Atlantic regions, and has several names, the most appropriate of which is ' balsam fir,' coined from the tree's technical name.

Abies lasiocarpa (Hook.) Nuttall is one of the smallest of the western firs and perhaps also one of the least known there, owing to the fact that it grows chiefly at high altitudes. The common name, ' alpine fir,' adopted here, would seem to be the most appropriate one for this species, because it refers to the tree's high mountain habitat. Woodsmen and settlers usually call it ' balsam ' or ' mountain balsam.'—*A. D. W.*

Stocks used by the Chinese. By Frank N. Meyer (*Queensland Agr. Jour.* p. 254; Oct. 1916).—In the neighbourhood of Tientsin Chinese gardeners graft flowering plums upon *Amygdalus Davidiana*, which they call by a name meaning literally "Mountain peach-tree"; Chrysanthemums are grafted on wormwood (*Artemisia*), tea olives (*Olea fragrans*) on privet, and junipers upon the Arbor vitae (*Thuja orientalis*). The Chinese, in North China, at least have tried to find congenial stocks which have root systems that are better suited to dry and alkaline soils than were the root systems of the plants themselves.—*C. H. H.*

Sugar-Beet Breeding, Some Recent Investigations in. By F. J. Pritchard (*Bot. Gaz.* Dec. 1916, p. 425; 51 figs.).—The author gives the following summary of his investigations :—

1. Differences in the size and sugar content of individual beet roots show no evidence of inheritance. They are fluctuations, therefore, and apparently play no part in beet improvement.
2. No correlation was discoverable between percentage or quantity of sugar in sugar-beet roots of ordinary sizes and their yield of seed and the average percentage of sugar in their progeny.
3. The fluctuations of beet families planted in progeny rows in alternation with check rows exceeded their real differences, but real differences were distinguishable by the use of a large number of replications.
4. Areas of beets in an apparently uniform field of small dimensions showed a difference of 2 per cent. sugar.
5. Percentage of sugar and yield of sugar of sugar-beet rows vary independently.
6. The average weight of root from a row increases with yield of sugar and decreases with percentage of sugar.
7. The discontinuance of selection for one generation caused no deterioration in percentage of sugar. In fact, there was some apparent gain.
8. No improvement in yield or percentage of sugar was obtained by continuous selection. Both the good and the poor families transmitted average qualities.—*R. J. L.*

Sulphur, The Relation of, to Soil Fertility. By O. M. Shedd (*U.S.A. Exp. Stn. Kentucky, Bull.* 188, December 1914).—Sulphur is an important factor in the maintenance of soil fertility. It is rapidly oxidized to sulphates in soil, the more fertile the soil the greater the oxidation. Sulphur produces acidity, and should only be used in conjunction with calcium carbonate.

Experimental results show that the sulphates of magnesium, iron, sodium, potassium, ammonium, gave the best results as compared with carbonates, only four in thirty-eight trials gave less yields than checks.—*C. P. C.*

Sunflower 'Excelsior.' By F. Bonvallet (*Le Jard.* vol. xxxi. pp. 100, 101; 2 figs.).—' Excelsior ' is a hybrid of *Helianthus cucumerifolius* var. *purpureus* and *H. annuus* var. *gaillardioides*. It is robust, attaining a height of six feet, and very floriferous. The central disc of the flower rarely exceeds in dimensions that of *H. cucumerifolius*. It is surrounded by a reddish-purple or blood-red zone with a yellow aureole. The plant is easily raised from seed in a hotbed, if the outer husk is chipped.—*S. E. W.*

Sunflower, 'Excelsior.' By F. Cayeux (*Rev. Hort.* vol. lxxxix. p. 268; 1 col. plate).—*S. E. W.*

Surface Forces in Soils, Measurement of. By C. A. Shull (*Bot. Gaz.* vol. lxii., July 1916; 5 figs.).—It was found that the water-holding power of soils at the wilting coefficient was less than the osmotic pressure of the root hairs of many kinds of plants, as shown by Hannig and others. Thus the wilting of plants at the wilting coefficient of the soil cannot be due to lack of moisture in the soil, nor to lack of a gradient of forces tending to move water towards the

plant. The author concludes therefore that the wilting at this critical soil moisture content must be due to the increasing slowness of water movement from soil particle to soil particle, and from these to the root hairs, the rate of movement falling below that necessary to maintain turgidity of the cells of the aerial parts, even under conditions of low transpiration.—*R. J. L.*

Swede Turnips, Hydrolysis of the Soluble Protein of. By G. Williams (*Jour. Agr. Sci.* viii. pt. 2, pp. 182–215; March 1917).—The total weight of swedes grown in the United Kingdom is twenty-five million tons, and is thus greatly in excess of any other fodder crop. Recent work on the chemistry of nutrition shows that the average composition of the protein consumed by an animal should, in respect of the amino acids contained in the protein, approximate as nearly as possible to the protein of the body. A ration containing an excess or a defect of amino acids will result in the uneconomical utilization of the protein as a whole. Hence the importance of knowing the proportions of amino acids in the protein of various feeding materials.

To prepare the protein the juice is pressed from shredded turnips, and after filtration is heated in beakers up to 90° C. for thirty minutes. The protein which is thus precipitated as a white curd is washed repeatedly, first with hot water, then alcohol, and lastly ether, and is finally dried *in vacuo* over sulphuric acid. The product is a light grey, easily powdered mass. Six litres of juice give six grams of protein, containing 14 to 16 per cent. of nitrogen. The determination of the diamino acids arginine, histidine, and lysine was carried out according to the methods of Kossel, Kutscher, Patten, and Steudel. Foreman's method (*Jour. Agr. Sci.* iv. 31, 1911) was followed for the amino acids proline, alanine, glycine, leucine, and valine.

Other amino compounds were also estimated, viz. tyrosine, cystine, aspartic and glutamic acids. The percentages of the sixteen amino and other compounds determined are given.—*J. E. W. E. H.*

Tar Water for Thrips. By C. French (*Jour. Agr. Vict.* Oct. 1916, p. 606).—Boil 1 lb. coal-tar in 2 gallons of rain-water, and while hot add from 50 to 100 gallons of water; spraying with this tar-impregnated water, or a weak paraffin emulsion, is recommended as a deterrent for thrips.—*C. H. H.*

Thielavia basicola, New Hosts of. By J. Johnson (*Jour. Agr. Res.* vii. pp. 289–300, Nov. 1916; plates).—This fungus has been reported upon thirty-nine different hosts, mainly members of the Leguminosae, Solanaceae, and Cucurbitaceae, with a few representatives of other families. The author adds sixty-six new hosts, twenty-eight of which are legumes, twenty belong to Solanaceae, seven to Cucurbitaceae, and eleven to various other families. He considers *Phaseolus multiflorus*, *Nicotiana rustica*, *Scorzonera hispanica*, *Daucus Carota*, *Apium graveolens*, *Beta vulgaris*, and *Pastinaca sativa* should, pending further experiments, be excluded from the list. He found great differences in susceptibility to attack existing among various species, but there appear to be no specialized races of the fungus, since nearly 100 different species of plants were infected with *T. basicola* from the tobacco.—*F. J. C.*

Timber, The Neglect of Home. By Sir Robert Lorimer (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 103–108; July 1916).—Among the rarer woods, which might be more grown and which would be much more used in cabinet work if they could be got with any certainty, are cedar, gean (wild cherry), mulberry, laburnum, holly, cherry, and yew. Yew stands almost by itself. It is a most beautiful wood for cabinet work, and owing to its scarcity it is almost always used in the form of veneer. If left for some length of time in pond water, or, better, if a log can be got that has been long submerged in a bog, it becomes a lovely purplish violet colour, cooler in colour than the famous West Indian King wood which the French are so fond of using in their fine veneered cabinet work.—*A. D. W.*

Timbers, Durability of. By Percy Groom (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 44–46; Jan. 1916).—According to observations made in French coal-mines the following represents the order of durability of pit-props (beginning with the most and ending with the least durable) made of different woods: (1) oak, (2) Scots pine, (3) alder, (4) ash, (5) cluster pine, (6) *Robinia Pseudacacia*, (7) willow, (8) maple, (9) elm, (10) aspen, (11) cherry, (12) birch, (13) hornbeam, (14) beech, (15) poplar (not aspen). Not perfectly in accord, but mainly so, were the results obtained by R. Hartig with buried wood (heart-wood or its equivalent). He found (*a*) most durable, larch, Scots pine and *Robinia Pseudacacia*; (*b*) less durable, oak and elm; (*c*) still less durable, common silver fir and Norway spruce; (*d*) least durable, lime, birch, beech, and poplar.—*A. D. W.*

Tobacco Mosaic Disease, a Specific Form of. By H. A. Allard (*Jour. Agr. Res.* vii. pp. 481–7, Dec. 1916 ; pl.).—A few plants of *Nicotiana viscosa* developed mosaic disease in a field. They were further studied and the virus from them proved infectious to other plants of *N. viscosa* and its hybrids with *N. Tabacum*, but not to *N. Tabacum*. Attempts to infect *N. viscosa* from *N. Tabacum* affected with mosaic disease proved abortive, and the hybrids between *N. viscosa* and *N. Tabacum* also proved immune from the attacks of mosaic disease when inoculated with the virus from *N. Tabacum*. The hybrids were externally very much like the seed parent, *N. Tabacum*.—*F. J. C.*

Tobacco, Some Properties of the Virus of Mosaic Disease of. By H. A. Allard (*Jour. Agr. Res.* vi. pp. 649–674 ; 1916).—Some investigators have attributed the occurrence of mosaic disease of tobacco (and other plants such as tomato) to the presence in abnormal quantities of oxidases and peroxidases, but the origin of the disturbances which have caused the development of these abnormal amounts are somewhat in doubt. The author shows that the infectivity of the sap from diseased plants is destroyed by alcohol of 75 to 80 per cent. but not of 45 to 50 per cent. The peroxidases may be destroyed by hydrogen peroxide without adversely affecting the virus. Weak formaldehyde solutions do not destroy the virus, but when stronger concentrations are used the solutions are no longer infective, although peroxidase reactions may be intense. Ether, toluene, chloroform, carbon tetrachloride, and acetone all failed to destroy the infectious principle in mosaic leaves, but it is quickly killed at temperatures near boiling point of water. The virus is highly resistant to low temperatures, enduring a temperature of $-180°$ C. without weakening its infective powers. Other observations, together with the foregoing and the fact that mosaic disease does not occur in absence of infection, lead the author to conclude that " a specific, particulate substance not a normal constituent of healthy plants is the cause of the disease. This . . . agent is highly infectious and is capable of increasing indefinitely within susceptible plants . . . it is an ultramicroscopic parasite of some kind."—*F. J. C.*

Tomato and Bean Bug. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 649–650 ; 1 plate).—The adult Tomato and Bean Bug (*Nezara viridula*) is shield-shaped. It is of a rich green tint, and easily escapes detection on the foliage of a tomato plant. The eggs are laid on the surface of the leaves. These leaves should be cut off and destroyed. The adults can be shaken off the plants on to a sheet.—*S. E. W.*

Vanillin, A Field Test with the Toxic Soil Constituent. By J. J. Skinner (*U.S.A. Dep. Agr. Bur. Soils, Bull.* 164, Jan. 1915).—Vanillin is found as a constituent in many plants and soils. When isolated it is toxic to plants in varying degrees, according to type of soil and its concentration therein.

It is demonstrated that while 400 to 500 parts per million of vanillin proved harmful in one soil, it had much less effect in another.

Field results on an area of $8\frac{1}{4}$ square feet gave the following decreases :—

Cowpeas, 33 per cent. green hay
" 35 " pods
Garden peas, 30 per cent.
" " 20 "
String beans, 336 lb. ; vines, 122 lb. pods from an acre.

The ill effect of vanillin persisted, and was harmful to plants six months after crops were harvested.—*C. P. C.*

Vegetable Crops in Porto Rico, Insects Affecting. By Thomas H. Jones (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 192 ; April 1915 ; 4 plates).—Upwards of thirty-nine varieties of insects attack vegetables in Porto Rico, many of which already occur in the United States. Several, however, are not known to be present on the mainland. This bulletin is the result of an effort made by the Dep. Agr. to obtain information upon obnoxious insects liable to introduction. *V. G. J.*

Vegetative Succession under Irrigation. By J. F. MacBride (*Jour. Agr. Res.* vi. pp. 741–759 ; August 1916 ; plates).—This is a valuable contribution to our knowledge of the changes that occur in vegetation through interference with natural conditions. Land periodically flooded in order to form artificial pasturage was studied, and the sequence in which various plants originally forming part of the vegetation were killed out and replaced by *Deschampsia caespitosa*

and *Agropyron* sp., which form the two most valuable pasture grasses of the district, is recorded.—*F. J. C.*

Weeds of New South Wales (continued). By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 865–867; vol. xxviii. pp. 46–48, 131–133, 181–184, 244–246; 8 col. plates).—Coloured plates represent the Poison Buttercup (*Ranunculus sceleratus*), the Rough-seeded Buttercup (*R. muricatus*), the Sow Thistle (*Sonchus oleraceus*), Cat's Ear (*Hypochaeris radicata*), Petty Spurge (*Euphorbia Peplus*); Bushy Starwort (*Aster subulatus*), St. Barnaby's Thistle (*Centaurea solstitialis*); Groundsel (*Senecio vulgaris*), Prickly Lettuce (*Lactuca scariola*), and *Soliva sessilis*. *R. sceleratus* should be dug up and destroyed on account of its poisonous properties.—*S. E. W.*

Western Plant Studies, IV. By A. Nelson and J. F. Macbride (*Bot. Gaz.* vol. lxii. No. 2, Aug. 1916).—The authors give detailed botanical descriptions of the following species:—*Plagiobothrys Harknessii*, n. comb.; *P. folioceus*, n. comb.; *Cryptantha vincteus*, n. sp.; *Oreocarya dura*, n. sp.; *O. propria*, n. sp.; *Amsinckia carinata*, n. sp.; *Mertensia Palmeri*, n. sp.; *Pentstemon minidokanus*, n. sp.; *P. payetensis*, n. sp.; *Machaeranthera rhizomata*, n. sp.; *M. inops*, n. sp.; *Macronema filiformis*, n. sp.; *M. glomerata*, n. sp.; *M. Walpoliana*, n. sp.; *M. scoparia*, n. sp.; *M. pulvisculifera*, n. sp.; *M. imbricata*, n. sp.; *Evax breviflora*, n. comb.; *Lactuca spicata* var. *multifida*, n. comb.—*R. J. L.*

Wetting Substances, Accessory, with Special Reference to Paraffin Emulsions. By A. H. Lees, M.A. (*Ann. Appl. Biol.* iii. No. 4, April 1917, pp. 141–149; tab.).—One of the most important points of a spraying fluid for insect or fungus pests is its wetting power. The addition of soft soap to certain proprietary insecticides increases their wetting powers and therefore their killing powers. Soap is ineffective against colonies of woolly aphis on account of the waxy thread coverings excreted by the insects, and the same trouble is experienced in the case of American Gooseberry Mildew.

Experiments with paraffin emulsions as "wetting agents" were very fully carried out. The cheapest and most effective mixture is a 2 per cent. emulsion (20 lb. soap to 100 gals. water, and 2 gals. paraffin to 100 gals. water). Its value lies not so much in its own killing powers but in its action as a carrier for other fungicidal or insecticidal bodies, which, alone, would not effectively eradicate the pest. Thus, liver of sulphur used with the 2 per cent. mixture has given promising results on a commercial scale against American Mildew. It has also been found possible to kill the raspberry beetle with the 20 per cent. mixture united with a dilute nicotine solution.—*R. C. S. R.*

Weymouth Pine in the Surrey Desert. By B. W. Adkin (*Quart. Jour. of Forestry*, x. pp. 185–193; July 1916).—The Weymouth pine is no recent introduction. It has been planted somewhat extensively in this country for about two hundred years. It ranks highly both for ornament and sylviculture. In its native land the Weymouth pine is said to have attained a height of from 150 to 175 feet, and a girth of 10 to 15 feet; but in Britain a height of 60 to 80 feet may be taken as an average; trees over 90 feet are rare, and the tallest ever recorded was but 122 feet high.

On suitable soils and situations Weymouth pine should give a better financial return than Scots pine, for three reasons: firstly, it should yield a larger number of cubic feet an acre on account of its more rapid growth and its greater shade-bearing properties; secondly, it should be ready to cut on a shorter rotation, and thus prevent such an accumulation of compound interest; and, thirdly, if a good market could be found for British timber, Weymouth pine should fetch a considerably higher price a cubic foot than Scots pine.

From all points of view, therefore, it would appear that Weymouth pine is to be regarded as a good tree to grow for sylvicultural purposes in Britain.
A. D. W.

Willows: their Growth, Use, and Importance. By George N. Lamb (*U.S.A. Dep. Agr., Bull.* 316, Dec. 20, 1915).—There are in the United States and Canada from eighty to a hundred species of willows, distributed from the Gulf of Mexico to the Arctic Circle, and from tide-water to the tops of the highest mountains. They range from a tiny plant a few inches high to a forest tree 4 feet in diameter and 140 feet in height. All the shrubbery species are useful as soil cover, forage, or basket material. Scarcely more than a dozen, however, are of prime economic

importance. Of these, six are species imported from Europe: the basket willows, which are the American green willow (*Salix amygdalina*), the Lemley willow (*S. pentandra*), and the purple willow (*S. purpurea*), and three tree willows, the white willow (*S. alba*), the crack willow (*S. fragilis*), and the weeping willow (*S. babylonica*). There is only one native tree species of wide distribution and importance, and this, the black willow (*S. nigra*), is found from coast to coast and from the Lakes to the Gulf.

The black willow is by far the most important of the native species. In the region of its best development, trees have been found 4 feet in diameter at breast-height and 140 feet in height. The leaves are long and narrow, gradually running out into a long, usually curved tip. They are thin, occasionally sickle-shaped, bright green, and rather shiny. In width they vary from ⅛ to ¾ inch; in length from 3 to 6 inches, being usually about 3 inches. The buds are pointed, and ⅛ inch long. The flowers, which are borne on catkins terminal on leafy branches, are from 1 to 3 inches long, with short yellow scales. The bark has characteristic corky protuberances on branches from one to three years old. These are particularly abundant on vigorous sprouts grown in the open and more occasionally in dense seedling stands. The bark of old trees is from 1 inch to 1½ inches thick, occasionally 2 inches.—*A. D. W.*

Winter and the Rock Garden. By J. H. Scaife (*Irish Gard.* xii. June 1917, p. 82).—A chatty article, showing the effect the winter of 1916–17 had on the plants in an Irish rock garden. A contrast is made between the winter of 1915–16 and 1916–17, the former winter being mild up to March 1916 brought Saxifrages and many other plants out into flower in January. The writer tells us that Saxifrages have stood the weather well: certain Geraniums and Erodiums also have not suffered. But he says that Aethionemas, Lithospermums, and Hypericums have not been too happy; these fear east and north-east winds more than the cold.—*E. T. E.*

Winter Cultivation, Early and Late Compared. By E. E. Pescott (*Jour. Agr. Vict.* Sept. 1916, p. 574).—It is most important in Australia to plough the orchard early to take advantage of the moist surface and consequent easy ploughing; and also to conserve as large an amount of moisture in the soil as possible. The longer the ploughing is delayed, the less an amount of moisture is retained in the soil for summer use. Deferred ploughing certainly means dry soil, enfeebled trees, and diminished results. The earlier the ploughing, the more soil water is conserved. When the ploughing is completed, the clods should be crushed and the land harrowed, so that a fine earth mulch may be obtained. The orchard surface should be kept as level as possible, and no irregular ridging or furrows should be allowed. If plants of a leguminous nature are grown to supply humus, they give the best result if ploughed in when in full flower; if growth has been rank, the crop may be rolled before ploughing, or it may be mown, care being taken that the plants are distributed evenly over the ground, as large quantities in a mass should be avoided. Artificial or stable manures may be given the trees at the same time; they should be applied before ploughing.—*C. H. H.*

Wireworms. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917; p. 7).—Where free use of lime, basic slag, kainit &c., was made on the land under observation cultivators seldom complained of wireworms. The majority of the affected areas were situated on sunny hill-sides where the soil was dry and shallow. In their energetic search for larvæ some damage was caused by rooks disturbing the young swedes.

In spite of abundant larvæ few adult beetles were observed.

On farm lands, harrowing in soot with subsequent rolling proved excellent. Fifteen cwt. of ground lime to the acre, mixed with the soil during preparation for roots, aided the clearance of the pest.—*R. C. S. R.*

Wood Preservatives, Tests of. By Howard F. Weiss and C. H. Teesdale (*U.S.A. Dep. Agr., Bull.* 145, April 12, 1915).—In general, highly viscous oils do not readily penetrate, while oils with low viscosities penetrate wood readily. As temperature strongly influences the viscosity of oils, and as the diffusion of the preservative through the wood is one of the most important factors in proper treatment to secure best results, both the wood and the preservative should be sufficiently heated during the pressure period. Because of the low thermal conductivity of wood the treatments should not be made too rapidly. With water-soluble salts these precautions are not important.—*A. D. W.*

Woodland Ash. By Sir Hugh R. Beevor (*Quart. Jour. of Forestry*, vol. x. pp. 249–253; October 1916).—The following prices a foot cube refer to regular sales from one thousand acres of woodland within a few miles of High Wycombe:

	Ash.		Oak.		Beech.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
1815	2	0	4	0	1	1½
1850–63	1	0	2	0		7½
1876–88	1	2	2	0½	1	3
1891	1	8	1	8	1	2
1909–1913 . . .	2	2	1	11	1	0¾

Even before the war ash timber was above the price of a century ago, and it has shown a steady rise in value during the past fifty years.

The great war is making an extraordinary inroad upon stocks; and this will greatly diminish supply.

In the varied dry and moist soil on the estate in question two features in the yield of ash call for attention—the quantity in relation to quality of soil, and the quantity in relation to pure or mixed crop an acre.

The yield on agricultural quality soil does not seem high—2,400 feet cube an acre, 1,380 of ash timber (twenty-seven trees), the rest oak with a few sycamore (thirty trees) was taken from a wood ninety years old. The ash were all sound, though not likely to continue so. However, the price standing of ash, 3*s.* 3*d.* a foot, made this wood a new record in many returns.—*A. D. W.*

Woolly-aphis-proof Apples. By E. E. Pescott (*Jour. Agr. Vict.* Oct. 1916, p. 621).—The following apples are included in a list of apples immune to woolly aphis in Australia: 'Emperor Alexander,' 'Annie Elizabeth,' 'Gravenstein,' 'Irish Peach,' 'London Pippin,' 'Northern Spy,' 'Reinette du Canada,' 'Winter Majetin,' and 'Winter Strawberry,' together with thirty-four Australian varieties.—*C. H. H.*

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PARTS II. AND III.

MILDEW-RESISTANT ROSES: WITH SOME SUGGESTIONS AS TO INCREASING THEIR NUMBER.

By WALTER EASLEA, F.R.H.S.

[Read July 17, 1917; Mr. W. H. DIVERS, V.M.H., in the Chair.]

THE subject of Rose mildew has been so ably dealt with in the past, both in the JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY and in other Journals, that I do not propose to attempt a description of this pest, even had I the technical knowledge to do so. My object is rather to ascertain if there be a possibility of increasing the number of mildew-resisting Roses. Should there be any representatives of the Sundriesmen here who do not entirely wish for mildew to disappear, even though they sell preparations that are absolute preventives, I would assure them at the outset that, in my opinion, our gardens will never be absolutely free from the fungus, seeing that there are so many lovely varieties that are badly addicted to mildew, but which no amount of persuasion could induce us to banish from our collections, and that they can go on making their preparations with a certainty that there will be a demand for them.

Yet, while I admit that much, I am very hopeful that the many eminent amateur hybridists of the Rose will soon obtain for us a number of mildew-resisting varieties, so that to a large extent the fungus will be banished from our Rose gardens.

Now, why do Roses take mildew? It is because the leaf is not able to resist the spores of the fungus, which is always close

by to attack it. This may be proved by growing certain varieties notoriously prone to mildew under glass and treating them to an application of sulphur fumes from Campbell's or any other vaporizer. They are for the time being encased in a coating of sulphur that defies the mildew spores, and it is only when new growths appear that attacks succeed if the vaporizing is not persisted in.

Now, we cannot encase Roses outdoors in like manner, however carefully we spray them, so that to have Roses free of mildew we must raise Roses with mildew-resisting foliage.

I readily confess that the subject opens out possibilities that are far too vast for me to attempt to describe in the limits of a paper, but I will endeavour to give a few ideas that may form the basis for some hybridists who have the opportunity to experiment.

I have noticed, as no doubt most observers have done, that mildew is very rife among some of the old tribes of Roses such as *Rosa gallica*, and I think we can very justly blame them for handing down to the so-called Hybrid Perpetuals this tendency to mildew, which has been largely responsible for their banishment from modern gardens. Take old 'General Jacqueminot' for instance, or 'Abel Carrière,' or 'Mrs. Sharman Crawford,' what terrors they are for mildew! Did they inherit it from the 'Gallicas' or 'Damask Perpetual'?

To show that Roses have the power to perpetuate the plague among their descendants, I may point out one example.

We all know that the ubiquitous 'Dorothy Perkins' is a Rose frequently blighted by mildew, and we know it has not inherited it from *R. Wichuraiana*, its seed parent, but from 'Mrs. Sharman Crawford,' its pollen parent. I do not claim that this is an absolute test, because probably instances could be cited of the reverse action; but I will give an illustration on the other side.

One of the grandest Rambler Roses of modern times is 'American Pillar,' a Rose with glorious foliage and splendid trusses of blossom. This was raised by Dr. Van Fleet, of the Department of Agriculture, Washington, from *R. Wichuraiana* × *R. setigera*. Here we have an instance of a thick leathery leaf, such as *R. setigera* produces, being blended with the tiny foliage of *R. Wichuraiana*, and yielding the grand foliage of this fine variety. *R. setigera* was also one of the parents of 'Reine Olga de Würtemberg,' which is also renowned for its beautiful mildew-resisting foliage.

As is generally known, *R. Wichuraiana* has been largely employed by Rose-hybridists as the seed parent of many of our best Ramblers, and when it has been crossed with the glossy-leaved Tea Rose it has produced mildew-proof foliage. Such examples are found in 'Jersey Beauty,' 'Léontine Gervais,' 'Albéric Barbier,' 'François Juranville,' 'Dr. Van Fleet,' 'Miss Helyett,' 'Edmond Proust,' 'Gardenia,' and many others.

It seems therefore, if we would continue this type, we must use the glistening-foliaged Tea and China Rose as pollen parents. Strangely, by crossing *R. Wichuraiana* with large-flowered Hybrid Perpetual Roses

like 'Mrs. Sharman Crawford' and 'Paul Neyron,' we obtain the huge trails of blossom of 'Dorothy Perkins' and 'Minnehaha,' but, alas, also the mildew. We see mildew badly bequeathed to the offspring in the case of 'Wichmoss.' *R. Wichuraiana* was the seed parent, and the Moss Rose 'Salet' the pollen parent.

'Salet' is one of the worst Moss Roses to mildew, so that although we have a curious blending of *R. Wichuraiana* and the Moss Rose in 'Wichmoss' it is not the type we need to perpetuate.

I think Dr. WILLIAMS is on the right lines in using 'Jersey Beauty' as a seed parent. His two fine novelties, 'Emily Gray' and 'Lucy Williams,' are splendid mildew-proof Roses; and 'Shower of Gold,' raised by Messrs. PAUL & SON, owes also its freedom from mildew to 'Jersey Beauty.'

Dr. VAN FLEET has been successful in the use of *R. sinica* or *laevigata* as pollen parent. By crossing *R. Wichuraiana* with the thick, smooth-leaved species, *R. sinica*, he has produced 'Silver Moon,' a Rose that will become very popular for its lovely foliage and huge semi-single blossoms.

By crossing *R. sinica* with a Tea Rose J. C. SCHMIDT has given us *R. sinica Anemone*, a most beautiful variety with wonderful foliage, and doubtless this variety is capable of yielding other fine mildew-proof Roses by judicious crossing, which may also overcome the tenderness of the parents.

R. Brunonii should give us some good mildew-proof seedlings. We have a grand one in 'Miss Florence Mitten,' and it is another variety I would advise hybridists to utilize as seed parent.

R. multiflora or *polyantha*, although not addicted to mildew itself, seems to have been responsible for many badly mildewed Ramblers, so that one would be wise to avoid its use as a parent. The variety 'De la Grifferaie,' often used as a stock for climbing Tea and Noisette Roses, should find no place in our gardens, for in autumn it is white with the pest, and plants budded upon it should be avoided. I cannot help thinking such a stock has a deleterious effect upon the plant as far as encouraging mildew is concerned. A variety of *R. polyantha* named *grandiflora* might be the basis of some good mildew-proof Roses. Although it is generally known as of *polyantha* origin, the Kew authorities call it *Noisettiana grandiflora*, and I am inclined to think it is not, strictly speaking, a variety of *R. polyantha*.

A Noisette Rose, 'Aimée Vibert,' is such a splendid mildew-resisting variety that I would strongly recommend its use in hydridizing, especially with the Teas, so that we might obtain more perpetual-flowering mildew-proof climbers. There are two distinct forms of 'Aimée Vibert.' The one known as *scandens* being much more of a climbing habit than the other.

Herr PETER LAMBERT has crossed it with 'Crimson Rambler,' and we have as a result the variety 'Hauff,' of fine foliage and an almost perpetual bloomer, but with a very ugly-coloured flower.

'Claire Jacquier' seems to me to be a hybrid Noisette, and it is

so splendidly free of mildew that I think good results would follow if crossed with Tea Roses, probably giving us some perpetual-flowering mildew-resisting varieties. I have crossed it this year with the old 'Burghley Yellow,' and am looking forward to obtaining the long-wished-for Yellow Rambler. We raisers are always most optimistic in our work, and although we suffer many grievous disappointments, yet that does not diminish our ardour.

Our native Briar, *R. canina*, is a good mildew-resister, and we see in 'Una' what beautiful results might follow its use as a seed parent.

A fine mildew-proof Rose is *R. bracteata alba simplex*. There is a lovely Rose exhibited to-day by Messrs. W. Paul & Son, named 'Mermaid.' You will observe its beautiful glossy foliage, which is, I should say, quite mildew-proof. The raisers intimate its origin to be *R. bracteata* × Tea, I believe, or H. Tea. This may be the forerunner of many grand mildew-resisting varieties.

Some good species which I recommend for trial as a means of obtaining mildew-resisters are: *R. lucens*, *R. nitida*, *R. seraphina*, *R. altaica*, *R. Verbergi*, *R. glutinosa*, *R. microphylla*, *R. laxa*, *R. Souleii*, *R. Moyesii*. I am indebted to H. R. Darlington, Esq., for these suggestions, and to W. Watson, Esq., of Kew, for enabling me to show you some of them here to-day, and those interested will find them labelled before me.

Now, I have dealt largely with the Rambler class, and I take it we shall have no difficulty in obtaining mildew-resisting Roses sufficient for our needs from the various species and types mentioned. It is when we come to the more popular garden or decorative perpetual-blooming Roses that our difficulties increase, and I cannot hold out any hopes of a large increase to the mildew-resisting Roses so long as the present system of crossing Hybrid Teas with each other is carried on.

We see, for instance, the bad mildew trait of 'Mme. Abel Chatenay' perpetuated over and over again in her offspring, but she is such a fine flower, and has so many good points as a garden Rose, that hybridizers cannot resist the temptation to cross-fertilize this variety in order to obtain reds, yellows, and other shades of the same type of flower.

I have an idea, but I may be wrong, that much of the mildew trouble present among Hybrid Teas may be traced to the old 'Devoniensis,' a Rose that mildews badly. It was one of the parents that Bennett employed to obtain his 'Lady Mary Fitzwilliam,' the other parent being 'Victor Verdier.' I believe 'Lady Mary Fitzwilliam' was one of the parents of 'Mme. Abel Chatenay.' It was also responsible on the pollen side for 'Margaret Dickson,' a terror for mildew, and 'Caroline Testout,' another culprit in this respect. 'Caroline Testout' bequeathed the tendency to mildew to 'Frau Karl Druschki,' and so we might go on, tracing back to the one origin in 'Devoniensis.'

Now when two mildew-proof Tea Roses, such as 'Papa Gontier' and 'Madame Hoste,' are crossed we obtain 'Lady Hillingdon,' which with me rarely mildews.

I have a firm belief that the crossing of the true Teas, such as 'Anna Ollivier,' 'Mme. Antoine Mari,' 'G. Nabonnand,' 'Rosomane Narcisse Thomas,' 'Sulphurea,' &c., which are in themselves mildew-proof, will give us some good mildew-proof Teas. On the other hand, I also advocate raising seedlings from some of these and other mildew-proof varieties without artificial crossing.

As far as we know, all of those just named were the result of self-fertilized seed, as were many of the old Teas now gone into oblivion. Some of the old French raisers were in the habit of fertilizing flowers with just any kind, adopting no method whatever. Even as recently as five years ago, I saw in a celebrated raiser's gardens at Lyons many hundreds of seedlings without any distinctive labels whatever, and I always have my doubts about the authenticity of the Continental crosses. At present my greatest hope in obtaining mildew-proof Roses is in the comparatively new group known as 'Pernetiana' Roses. This bids fair to be a most important group in the near future. We were somewhat disappointed at the behaviour of 'Rayon d'Or,' one of the first M. Pernet-Ducher gave us. It was the result of a cross between 'Mélanie Soupert' and a seedling from 'Soleil d'Or,' and the 'Lyon Rose' was from a similar cross.

Now, in 'Rayon d'Or' we have the true mildew-proof foliage, thick and glistening, and to this fine Rose we owe the introduction of 'Cissie Easlea,' one of the grandest Roses for foliage we have in our collection.

'Louise Catherine Breslau,' 'Constance,' 'Mrs. Wemyss Quin,' and 'Golden Emblem,' I take it, have the 'Rayon d'Or' blood in them. 'Golden Emblem' has glorious foliage, and will, I believe, equal 'Cissie Easlea' in this respect. Happily these Roses possess the more sturdy nature of the Hybrid Teas, and do not appear subject to the black-spot and dying-back of the wood as seen in 'Rayon d'Or.' Mr. Courtenay Page has a fine golden seedling raised from 'Mélanie Soupert' × 'Rayon d'Or,' which he has named 'Tim Page.' This has grand mildew-proof foliage.

I anticipate quite a number of advances in this direction, and if we can obtain longer petals and better form in crimsons, pinks, and whites they will largely displace the Hybrid Teas in the near future. I see no reason why crosses should not be effected between this group and the true Teas of the 'Madame Hoste' type, obtaining for us probably petals of greater length.

The China Teas, such as 'Comtesse du Cayla,' are another group worthy of the hybridist's attention, having in view mildew-proof Roses. The old common monthly would surely produce good things judiciously crossed, and I have proved that these semi-double and even single Roses often yield good double flowers aided by the hybridizer's art.

The *rugosa* Roses have long been eminent for their thick leathery foliage, but hitherto the results from crossing this group have not yielded very shapely flowers, although some grand decorative kinds have resulted. One kind, *R. rugosa* 'Georges Cain,' possesses such fine foliage and good deep petals that I strongly advise raisers to use it as a seed parent.

Another tribe, namely, the Hybrid Musks, seems to me capable of producing good mildew-proof Roses.

One kind, namely, 'Trier,' has been used, I believe, by the Rev. J. Pemberton as parent for some of his interesting novelties, such as 'Danaë,' 'Moonlight,' &c., although I have no authority for saying this.

'Trier' is mildew-proof, and was raised by Lambert from 'Aglaia' × 'Mrs. Sharman Crawford.' Here we see the influence of the mildew-resisting seed parent 'Aglaia' overpowering the badly-mildewed parent 'Mrs. Crawford.'

'Aglaia' emanated from *R. polyantha* × 'Rêve d'Or,' both mildew-resisters.

'Trier' has produced 'Adrian Riverchon,' a fine single mildew-resister, and is capable, in my opinion, of giving us many very lovely perpetual-flowering mildew-proof shrub Roses, for we cannot term them Climbers or Ramblers.

In a paper on this subject one is handicapped by the reticence regarding parentage adopted by our Irish and other Rose-growers, and I could wish the task had been deputed to one of them to write it, for they could, if they would, throw much light upon the question of mildew-proof novelties, but I am convinced myself that in order to obtain more mildew-resisters we must start right with mildew-resisting kinds. And I cannot help saying that a trial garden should be established by the National Rose Society or the Royal Horticultural Society, where experiments could be carried out by capable raisers, who would be able to devote more time to the work than the grower for sale can possibly give.

We see this accomplished in a small way when we remember the results achieved by Dr. VAN FLEET in America and Dr. WILLIAMS of Harrow; and I wish, as the result of these somewhat disjointed remarks, I could induce other private gentlemen or ladies to take up the work, which is full of fascination and capable of wonderful results.

I append a list of certain varieties I have found to be more or less mildew-resisting. This list, taken from the "Rosarian's Year Book" of 1916, would take some time to read, and Fellows will be enabled to scrutinize it in the JOURNAL of this Society.

Perhaps before I sit down I might just say to any novice in Rose-growing that mildew is largely engendered by errors in cultivation, such as overdosing with chemical manures, watering with garden-hose, and soil too porous, all producing a softness of foliage that makes it a prey to the fungus.

Hybrid Teas.

Antoine Rivoire.
Charles de Lapisse.
Chrissie McKellar.
Clara Watson.
Colleen.
Dorothy Page Roberts.
Earl of Warwick.
Ecarlate.
Entente Cordiale.
Florence Forrester.
General McArthur.
Gloire Lyonnaise.
Joseph Hill.
Lady Battersea.
Lady Dunleath.
Lady Greenall.
Lady Pirrie.
Le Progrès.
Lieutenant Chauré.
Louise Lilia.
Mabel Drew.
Marquise de Sinety.
Melody.
Mme. Charles Lutaud.
Mme. Edmée Metz.
Mme. Jules Bouché.
Mme. Wagram.
Mons. Paul Lédé.
Mrs. Aaron Ward.
Mrs. Arthur J. E. Coxhead.
Mrs. Arthur Munt.
Mrs. C. E. Allen.
Mrs. Edward Powell.
Mrs. Stewart Clark.
Mrs. T. Hillas.
Mrs. Wakefield Christie Miller.
Mrs. Wallace H. Rowe.
Natalie Bottner.
Old Gold.
Ophelia.
Peerless.
Rhea Reid.
Robin Hood.
Souvenir de E. Guillard.
Souvenir de Gustave Prat.
Souvenir de Marques Loureiro.
Theresa.
Triumph.
Walter Speed.
Warrior.

Pernetianas.

Arthur R. Goodwin.
Beauté de Lyon.
Cissie Easlea.
Constance.
Golden Emblem.
J. F. Barry.
Louise Catherine Breslau.
Mrs. Chas. E. Pearson.
Mrs. Wemyss Quin.
Rayon d'Or.

Teas.

Alexander Hill Gray.
Anna Ollivier.
Auguste Comte.
Betty Berkeley.
Comtesse Festetics Hamilton.
Corallina.
Freiherr von Marschall.
G. Nabonnand.
General Gallieni.
Homère.
Hugo Roller.
Jeanne Philippe.
Lady Plymouth.
Lady Roberts.
Madame Antoine Mari.
Madame Hoste.
Madame Jean Dupuy.
Maman Cochet.
Molly Sharman Crawford.
Mrs. Alfred Westmacott.
Mrs. R. B. Cant.
Mrs. Dudley Cross.
Mrs. Hubert Taylor.
Mrs. Sophia Neate.
Papa Gontier.
Paula.
Peace.
Rainbow.
Rosomane Narcisse Thomas.
Souvenir of Stella Gray.
White Maman Cochet.
W. R. Smith.

Chinas.

Comtesse du Cayla.
Mdlle. de la Vallette.
Papa Hemeray.

Polyanthas.

Canarienvogel.
Cecile Brunner.
Echo.
Eugénie Lamesch.
Gruss an Aachen.
Kleiner Alfred.
Léonie Lamesch.
Orleans Rose.
Perle d'Or.
Rödhätte.
Tip-Top.
White Cecile Brunner.

Hybrid Musks.

Adrian Riverchon.
Danaë.
Daphne.
Miss Florence Mitten.
Moonlight.
Queen of Musks.
Trier.

Dwarf Wichuraianas.

Iceberg.
Yvonne Rabier.

Various Roses.

Gottfried Keller.
Irish Fireflame.
Louis Barbier.
Moyesii.
Mrs. A. Kingsmill.
Sertata.
Sinica.
Una.

Climbing Roses.

Aimée Vibert.
Aimée Vibert à Fleurs Jaunes.
Albéric Barbier.
American Pillar.
Ariel.
Aviateur Blériot.
Carmine Pillar.
Château de Gros Bois.
Christine Wright.
Claire Jacquier.
Climbing White Cochet.
Désiré Bergera.
Dr. Van Fleet.
Edmond Proust.
Effective.
Evangeline.
François Foucard.
François Guillot.
François Juranville.
Gardenia.
Gerbe Rose.
Goldfinch.
Inermis Morlettii.
Jean Guichard.
Jersey Beauty.
Jessica.
Joseph Billard.
Joseph Liger.
Lady Waterlow.
Léontine Gervaise.
Longworth Rambler.
Marie Henriette Gräfin Chotek.
Miss Helyett.
Pink Pearl.
Polyantha grandiflora.
Renée Danielle.
Reine Olga de Würtemberg.
Ruby Queen.
Sanders White.
Shower of Gold.
Silver Moon.
Sodenia.
Source d'Or.
Sylvia.
Troubadour.
Veilchenblau.

THE LORETTE SYSTEM OF PRUNING
("La Taille Lorette").

By Herbert E. Durham, Sc.D., &c.
President Herefordshire Association of Fruitgrowers and Horticulturists.

[Read July 31, 1917; Mr. E. A. Bunyard, F.L.S., in the Chair.]

Whilst many methods of pruning have been advocated and practised, there is perhaps no one which is more based on physiological and botanical grounds than that propounded by Monsieur Louis Lorette (Professeur d'Arboriculture, Chef de Pratique horticole à l'École de Wagnonville), Chevalier du Mérite agricole. The set purpose is to evoke growth of certain dormant eyes, whose productions are apt to possess great fruit-bearing proclivities, rather than simply to restrain extension of growth for cosmetic reasons. Besides attending to the actual production of fruit and the maintenance of prescribed forms, Lorette's system has one important character, which is not so much in evidence in many other styles of pruning, in that the tree is made to bear its fruit where it is most to be desired, namely, close to the supporting stems. A sharp distinction is to be made between the *supporting branch* ("branche charpentière ou charpente") and the *fruiting branchlet* ("branche coursonne")*; and the fruiting branchlets are kept very short, so that the fruit is borne as close as possible to the supporting branch—at any rate closer than is possible with the classic "three-eye system" ("taille trigemme"). In this country the ordinary bush and dwarf standard forms are usually a complexity, wherein neither definite support nor fruiting systems can be distinguished.

In Lorette's system the whole of the pruning is done during the period of active growth, commencing in the spring and finishing in September. Winter pruning is abolished, and the usual distinction of winter pruning for wood production and regulation, and of summer pruning for fruit production, also falls away; for it is found that a sufficiency of wood is formed without resort to cutting in the dormant period of the winter months.

In France some authors have named the system the "Taille courte d'été" or "Short Summer Pruning." This, I venture to think, is a misnomer, as two important sections of the work are dealt with in the spring and the early autumn respectively; so that the extended title, if indeed any is needed, should rather be "Spring-Summer-Autumn Pruning." Inasmuch as the operations are carried out

* The want of recognized terms in English for parts of fruit trees makes it somewhat difficult to write on the subject without quoting the *French equivalents*.

during months of more agreeable weather conditions than obtain during the winter months, I venture to quote a passage from "The Clergyman's Recreation," by JOHN LAURENCE, 1718, wherein this old writer contrasts the advantages of budding over pruning in the following words: "I prefer Inoculation, because it may be performed by any Gentleman himself with more pleasure and less danger to his Health. It requires no daubing with Clay, only a Penknife and a little woollen Yarn, which are both portable, and therefore always ready to be made use of, whenever his Meditation shall give way to his Pleasure. Besides this Operation is performed in Summer and warm Weather, when it is healthful as well as pleasant to be busied in a garden with some such little amusement. Whereas the Season of Grafting is in the Spring, when there is more of taking cold in a Nursery, where you must expect wet feet and dirty hands." Had he lived 200 years later, we can imagine that he would have expressed the same notions in regard to Lorette's methods; indeed, as will be seen immediately, he seems to have been near practising the method itself.

Lorette's original methods are applied not only to the Pear-tree with its commonly three-year period for fruit-blossom development, and to the Apple-tree with its usually two-year period, but also, as he informed me, to the Quince-tree with its one-year period. Moreover, the principle of only pruning during activity is applicable to the Gooseberry and Currant. Lastly, the Peach-tree (and perhaps one might presume all the Prunus tribe) is submitted to special practices which have been elaborated by this astute and industrious worker.

RETROSPECTIVE AND HISTORICAL.

It was towards the end of June 1914 (19th) that I paid an all too short visit to Monsieur LORETTE at his plantations at Wagnonville (near Douai, Nord) to see and to learn at headquarters more of the system than had already been observed previously in Champagne and Normandy. In his book * there were many obscure points requiring elucidation, and I would gladly have paid him another visit before venturing to appear before you to-day; but unfortunately that has not been possible, for since the early days of the war the place has been in the occupation of the Germans, and correspondence on the subject has likewise been interrupted. It is to be hoped that the trees and their master may be found to be uninjured when at last they are freed from the enemy. In his plantation at the time of my visit there were trees which had been pruned on M. LORETTE'S ideas for eighteen years, no doubt with progressive modifications as time passed. Although some of my trees had been submitted to some extent to the system in 1913, it was only after my visit that I commenced in a more thorough manner on trees which now are in their fourth year of treatment.

Without any pretensions to having made an exhaustive search in

* *La Taille Lorette*, 1st ed. 1913, and 2nd ed. 1914. Versailles.

past writings I may call attention to the work of LAURENCE.* "Now begin the Summer pruning of Pears, cutting off the shoots of this year that come forward to half an inch, taking out the rest in the middle entirely where they crowd one another: But at the extremities of the Tree, if there be room, they may be let alone to the winter pruning. (1) all perpendicular shoots in the middle of the Dwarfs, should this month be reduced to half an inch, that they may put forth weaker and bearing Branches . . . July.† The Pear-tree is now to be minded and disciplined too, if overvigorous, cutting off all Branches still that push forward to half an inch . . ." Also SWITZER ‡ emphasizes commencement of operations in April and early May, rather however for the direct purpose of removing blighted twigs, and replacing them with healthy ones, than with a set intention of getting bearing wood. Indeed, the whole idea of summer pinching may have been derived from endeavours to combat pests and their works; and there can be little doubt that the harder fully developed leaves are less liable to damage by aphides &c. than young and tender shoots.

The definite appreciation of the value of shoots derived from the normally latent stipulary eyes, which forms so important a feature in Lorette's procedure, is to be found in DU BREUIL.§ When the shoot has reached "un longueur de 5 cm. à 6 cm., on le coupera à la base, en conservant seulement son empâtement. Les deux boutons (*yeux*) stipulaires qui accompagnaient le bouton principale donneront lieu, presque immédiatement à deux petits bourgeons beaucoup moins forts que le bourgeon principale. On supprimera le plus vigoureux des deux, et celui que l'on conservera, et que l'on soumettra au pincement, si cela est nécessaire, donnera lieu à un petit rameau qui se mettra facilement à fruit." As we shall see, the chief shoot is cut back at a very much younger stage than in LORETTE's practice; indeed, in the fifteenth (current) edition of the work the lengths given are shorter still.||

In respect to the fruiting capacity of the growths from stipulary eyes, it is perhaps not entirely fanciful to think upon the Peach and Apricot where the stipulary eyes develop into blossoms whilst the central bud gives a wood shoot.

PEAR AND APPLE.

We may now turn more particularly to the practical side of our theme as it affects the Pear-tree and the Apple-tree. Pruning may be classified into two categories: (1) that needed for forming or shaping, and (2) that for maintaining the form or shape and the productivity. It will be convenient to take the latter first, and also to deal with the conversion from classic methods to this novel system.

* *Op. cit. supra*, 1718, pp. 71 *et seq.* † p. 84.

‡ *The Practical Fruit Gardener*, 1724.

§ *Instructions élémentaires sur la Conduite des Arbres fruitiers*, Paris, 2nd ed. 1857, p. 57. I have not the first edition.

|| p. 112, 4 cm. to 5 cm.

Lorette pruning for maintenance. (1) Treatment of leading shoot or leader. This is the first operation of the year, and is undertaken in April, mid or late, indeed even in May, according to the situation, season, and soil. In any case, the Apple will be ready much later than the Pear. The criterion whereby the proper time is judged is the growth of side shoots from the pre-existent eyes to a length of about a couple of inches; this shows that the sap is rising well. If the tree is still being trained and has not yet reached its full designed height, LORETTE only pinches away the top few buds in cases where the tree is well sunned and exposed to the air; on the other hand, if it is not so favourably situate, and is shaded, a quarter or half may be removed, for the eyes are not so full of vigour, and there is little risk of engendering the growth of numerous premature shoots. The object is to get the majority of the eyes to become "dards" at once. Here I may say that much depends upon the local habit of the variety; in the soil of Herefordshire, such long pruning in fully exposed prolongations almost always fails to cause some nine or ten eyes to break, with the result that some 12 or 14 inches of bare wood with dormant eyes ensues, and is possibly the cause of so much unfurnished bare wood in plantations in the county. Perhaps ten or a dozen buds may be enough to leave, unless "notching" ("entaille" *) is made to awaken sleepers.

If, on the other hand, the tree has attained the desired proportions, the leader is cut back to about $\frac{1}{2}$ or $\frac{5}{8}$ inch above its base ("sur empâtement"). Several thin shoots will arise, and these are not interfered with. (See later.)

(2) Treatment of fruiting branchlets ("coursonnes"). The objects in view are to keep the fruit branchlets as short as possible so that the fruit may be borne as close as possible to the supporting branch, to evoke the formations from stipulary eyes and so produce new fruit buds to replace old ones. These branchlets may be fertile when they will mostly give rise to some wood shoots, which will be the only formation on sterile ones. The criterion for judging when these shoots are ready for cutting is a semiligneous condition at the base: they are somewhat woody, but somewhat juicy withal. The proper moment is indicated by the physiological condition rather than by a particular date or a precise diameter or length attained. In his book, LORETTE constantly speaks of performing on a shoot when it has reached the thickness of an ordinary pencil (about $\frac{1}{4}$ inch). However, he told me that this guide was rather to be regarded in training operations than in general maintenance, and it will be patent that much will depend upon the habit of the variety under the hand. On a tree in full bearing and on open site, the shoots will be about 10 to 12 inches in length,† as in the pruning I witnessed at Wagnonville, when perhaps none of the shoots removed was really of pencil-thickness. Where vegetation is still predominant and also in over-crowded or shaded parts of the tree, rather a greater length will

* See appendix for definition of terms.

† On a slow-growing variety like D'Arcy Spice 6–8 in. will be long enough.

form an index. The shoot should have become distinctly woody, and still be distinctly juicy at the site of the cut, at any rate in the case of the Pear; in the Apple, the shoots are of a drier quality.

At some time between the later days of May and the middle of June the shoots will be ready for pruning; some writers tend to fix June 15 as the date for commencement. Naturally the position of the trees will make a considerable effect on their progress; thus if they are "en espalier"—that is, trained against a wall or paling—they will be ready earlier than those grown in the open.

The upper half or third of the tree should be dealt with first, the lower parts perhaps a week or so later; this instruction is based upon the physiological ground of favouring the lower parts and sheltering them from denudation; it is most important when conversion to the method is being adopted.

It may be noted here that a considerable number of varieties have been tried and found to respond satisfactorily, so that the system is apparently applicable to any kind.

The treatment which is to be meted out to each shoot will depend upon its anatomical constitution. In order to explain this I must digress for a moment to consider the organs involved, and particularly their names; unfortunately we have not so good a vocabulary as the French for these things.

The ordinary "eye" or bud on the course of a shoot is a small blunt body, sometimes somewhat flattened and situate in the angle of attachment or axil of the leaf-stalk. The eye may break to form a wood shoot, of which several sorts are to be distinguished, or to form a fruiting organ (blossom or fruit-bud, "bouton à fruit"), or lastly it may remain dormant either permanently or until some stimulus is given to bring its vitality into an active phase. In the development of the fruit-bud, the first stage is known in France as a "dard" (pronounced dar, meaning a lance or dart from its sharp-pointed terminal bud when dormant); then the eye which produces it, instead of bursting into a shoot, may only grow out perhaps a quarter of an inch or less with a terminal conical bud, and generally three small leaves; next season, without much wood growth, the leaves increase to four or five, whilst the stem may begin to show grooving of the bark ("rides"); it may also make rather longer growth, when it is known as a long "dard" of 2, 3, or even 4 inches in length; beyond which it passes to the "brindille couronnée" or end-fruiting twig. In further growth it acquires five, six, or more leaves, clustered around its short stem, which is surmounted by a more rounded, fatter terminal bud—the fully formed fruit-bud; when it has arrived at this stage it is safely fixed in character, but in the earlier "dard" stage, if too much sap is directed thither it may grow out and become merely a wood shoot. The art of the fruit-grower is invoked to cause a sufficient run of sap to it for its sturdy and rapid development into a fruiting organ, and to avoid losing it from putting on too much pressure.

On each side of the principal eye, which is readily seen, there exist

another eye—the pair of stipulary eyes (" yeux stipulaires ou sous-yeux "), which can be awakened into activity; usually they remain dormant though still existing at the base or heel of the shoot. If we examine a vigorous shoot, it will be seen that the first few leaves are attached close about its base, and are four, five, or six in number; they form a little cluster like those about the fruit-bud, and we call them the Basal Cluster. In less sturdy shoots the cluster is reduced perhaps to three leaves, whilst in crowded regions, and especially on secondary or premature shoots ("bourgeons anticipés"), the arrangement may not be apparent. On further examination it will be seen that there are no apparent eyes in their axils; in French they are often called " folioles " in consequence; generally they are smaller than the other leaves, especially the lowermost, which is often cast off early. These basal leaves are important as they nourish the "invisible" buds at their axils, and these buds are wanted in LORETTE's system to produce fresh dards. Normally these leaves are implanted on a length of about ½ to ¾ inch, so that cutting back to this length leaves them intact, but removes all the leaves which have visible eyes. This cut is called the " taille sur empâtement," as an English equivalent to which I propose the phrase "*Cut to the basal cluster.*"

Another structure to which reference must be made is the " bourse " of the French; J. LAURENCE called this the " knob " about two hundred years ago, and I think that we may adopt his term for it, as we have none other. It is a somewhat fleshy thickening, especially in the Pear-tree, of a spur which bore fruit in the previous season, and is a fertile source of dards, though it also may give rise to wood-shoots. A cutting instrument will be needed, and the single curved sécateur is the most convenient; with a knife or parrot-beak shears the work is slower, because so much care has to be taken to avoid injuring leaves, especially those of the *basal cluster*. Since further growth in line is not needed, there is no cause for oblique cuts; moreover, it will be seen that further shortening may be done on the branchlet before the season is over.

After these introductory remarks we are in a position to proceed with the pruning of June (or May/June). There are three possibilities in the constitution of a shoot at or about its base.

1. There may be a fully-formed blossom bud.
2. There may be a " dard " (fig. 36).
3. Or there may be no sign of a fruiting organ.

In the first two cases, the shoot is cut back to leave one leaf with an apparent eye; the sap drawn by the basal cluster and the one other leaf is enough to throw in sufficient sap for either fruit-bud or dard, and not make the latter break. Where there is no fruiting organ the cut is made to the basal cluster to throw more sap back into the dormant eyes and cause them to make dards; where there is no definite cluster the base of the shoot is weak, and it is better either to remove it entirely, or leave two or three leaves if it is wanted. In the course

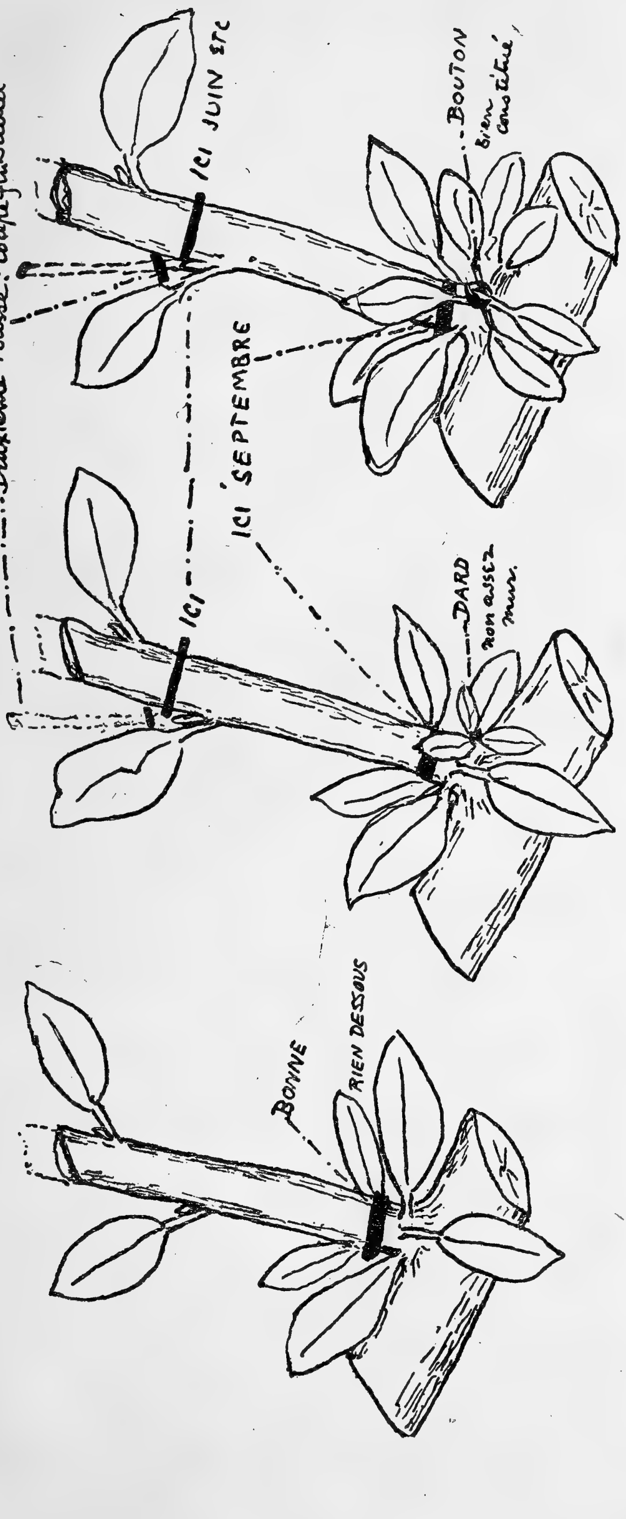

FIG. 36.—Copy of rough diagram submitted to M. Lorette, in July 1914, and marked and annotated by him. In many cases on converted trees there will be a distinct space between the support branch and the "dard" or fruit bud, and the basal cluster of leaves of course absent. The black bars indicate where transverse cuts are made at the times shown.

of events from the concentration of sap the basal cluster region often becomes swollen and looks much like a "knob," and with the increased nourishment one or more dards may make their appearance.

At this pruning it is well to give special attention to the "knobs," on which any single wood-shoot should be cut back to basal leaves, *although there will probably be dards or fruit-buds at their apparent bases*; if there should be many such shoots on a knob, the least vigorous is left with a couple of eyed-leaves, while the rest are completely removed; otherwise too much crowding will ensue.

Besides there will be a number of shoots which have not yet acquired sufficient size and consistence; these will be left to wait till next month, and are dealt with in the July (or July/August) pruning, when they, as well as any other shoots that have become sufficiently ripened, are dealt with on the lines that have already been laid down. Attention must be given to secondary shoots if any are sufficiently woody; they are removed with care to preserve the leaf whose bud gave them origin. Also, heed must be given lest side-shoots should rob the leader. Some writers apparently leave this pruning aside and await the August (or August/September) pruning, which is only a repetition of the process as regards both new shoots and secondary shoots. LORETTE regards the August pruning as one of great importance, for the sap is thickening and slackening; so that if the season be a wet one, the pruning should be delayed, but if dry and hot, it may be begun early in the month.

September pruning brings the treatment to its end for the season, so that when finished the trees are not touched with the sécateurs till the following spring.*

First of all, there will be a number of shoots to cut back to their basal clusters, and as growth has practically ceased no distinction is to be made between them, excepting only thin twiggy ones known as "brindilles." These may be left, but care must be taken not to retain too many, for they easily cause overcrowding. Those that are kept are best bent or bowed downwards ("down-bend") (fig. 37) to favour the formation of fruit-buds on them. This occurs naturally if a fruit is borne at the end ("brindille couronnée"). For the rest a general clearance is done, and wherever a good fruit-bud has formed the cut is made right back to it, otherwise the cut is "sur empâtement."† The fruit-bud, with five or six leaves in its cluster and some sign of cross-fissuring of its back, is fixed and will not turn into a wood-shoot. In M. LORETTE's words (private correspondence, July 1914): "Suppres-

* There is one small exception to this, as thinning of compound spurs is advised for November; five fruit buds should be left, and not only one or two as some writers recommend. Certainly the thinning out of spurs even to two or three on old trees seems to have a favourable effect.

† Note, July 1918. The cut back to a fruiting organ in September seemed quite a novel procedure. However, I find that J. J. Thomas (*The American Fruit Culturist*, New York, 1867, p. 240) recommends stopping or pinching of side shoots during the summer, and in conclusion writes: "Early in autumn the shortened shoots are to be cut down, leaving the fruit-buds, only, to bear the next season. By this regularity of pruning, the tree will preserve a neat appearance, and bear regular crops."

FIG. 37.—'BRINDILLES,' OR TWIGGY SHOOTS, ON WHICH THE 'DOWN-BEND' HAS BEEN DONE.

FIG. 38.—EARLY FIRST STAGE OF U OR DOUBLED U FROM STIPULARY BUDS.

Fig. 37.—The upper one is in its second year, kept for demonstration, uncut; the other is a last year's twig. Both are furnished with dards or bloom buds all the way along. In September these would be cut back to one or two blossom buds according to length; these have been left for the nonce as demonstration specimens.

Fig. 38.—On the right a bud is seen just shooting, on the left a roughness can be seen where the other bud is starting to break. Some basal cluster leaves were left, and two of their buds started but were rubbed out; the leaves were left to draw sap. (Rosemary Russet.)

[To face p. 268.

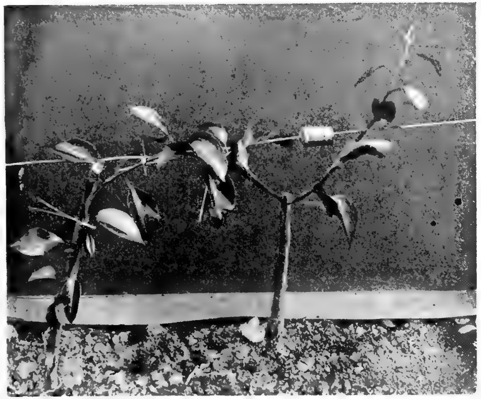

FIG. 39.—LATER FIRST STAGE OF U OR DOUBLED U FROM STIPULARY EYES. (Cf. fig. 38.)

The left-hand shoot is tied down, subsequently the leaves were also snipped to get equilibrium (Pear, Bé Superfin). The cork on the wire is perforated and split and forms a mode of preventing contact of wire and branch in tying up; canes or laths are tied on vertically for guiding and supporting the branches.

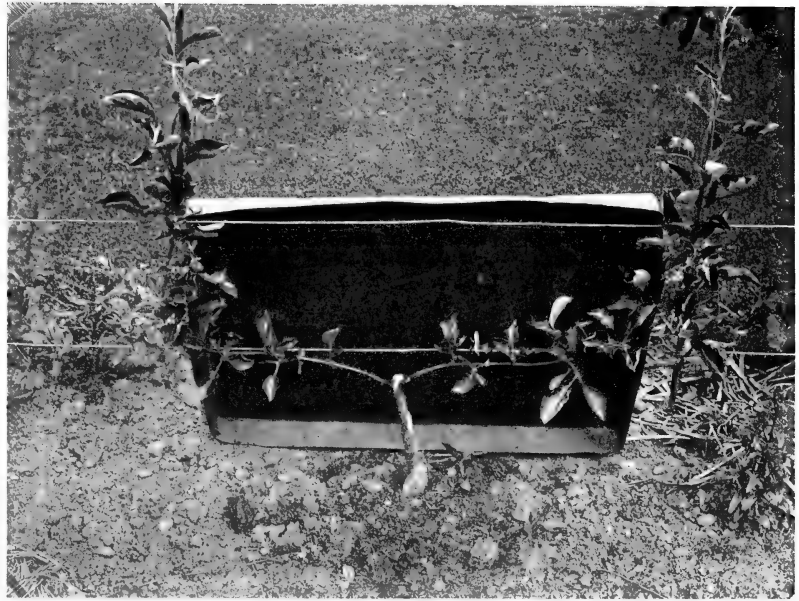

FIG. 40.—FINAL STAGE OF U, OR FIRST STAGE OF DOUBLED U COMPLETED (RIBSTON PIPPIN).

For distance of branches see text.

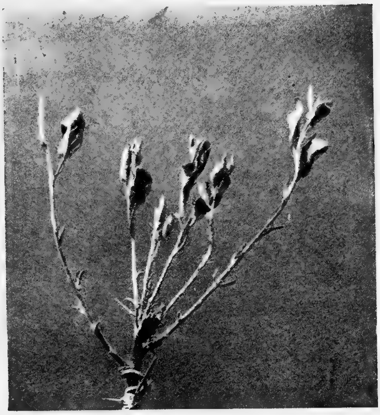

FIG. 41.—TO SHOW EFFECT OF OBTAINING BRANCHES CLOSELY NEAR THE SAME LEVEL. (See text.)

FIG. 42.—PEAR BLOSSOM AFTER FOURTH SEASON OF LORETTE PRUNING (OLIVIER DE SERRES ON LEFT, AND D. DU COMICE ON RIGHT).

These and other trees on the wall will be replaced with the more up-to-date Doubled U form.

FIG. 43.—RED CURRANT ('COMET') IN BLOSSOM AFTER TWO YEARS' LORETTE PRUNING.

FIG. 44.—GOOSEBERRY IN FRUIT AFTER TWO YEARS' LORETTE PRUNING.

The end spray has 28, the previous year section 29, and the year before that 10, but this is crowded at the base of the bush. I may note that the lozenge-trained hedge of M. Lorette (p. 199) was crowded with fruit all the way up when I saw it, similarly to this photograph.

[*To face p.* 269.

sion de toute la partie ayant servie d'appel sève première quinzaine de Septembre, c'est à dire qu'à cette époque on doit tailler sur le bouton bien constitué." The illustration, which is copied from a rough sketch submitted to and annotated by M. LORETTE, will make the matter clear. Thus, when the pruning is completed, there only remain fruit-buds, basal cluster stumps with or without dards at their bases, and some fine twigs. The leading shoots remain untouched till the following April if the tree is incompleted; but if full size has been attained they may now be shortened to 5 or 6 inches to prevent damage by wind during the winter, and cut "sur empâtement," that is to about ½ or ¾ inch in the spring.

If we look at an old standard tree which has not been subjected to pruning, we find that its leafage consists almost entirely of basal cluster leaves on its numerous fruit-spurs, with here and there a wood-shoot or two. The condition of a tree which has been Loretted is in much the same condition; its nourishment is largely dependent, indeed almost entirely, upon leaves of the basal cluster with the aid of those of the shoots which are not yet mature in the earlier prunings and of the twigs at the final pruning.

Modifications have already been introduced by various writers, some of whom fear to give up winter pruning entirely.

Personally, I do not adhere to getting all the pruning done at a more or less stated time. Where the ladder is required, the upper parts of the trees are fairly well cleaned up, but where one can reach from the ground I rather ramble around at any odd time and then deal with such shoots as may seem to require treatment. Difficulties may arise—or should I say judgment is sometimes required?—where trees are irregular and not standardized, as also in the balance of the upper and lower parts of the trees. Where doubt exists, it is perhaps safer to cut here and there only two or three leaves, when sap-drawers seem scanty or where the check of too much luxuriance might provoke too great a flow of sap where it is not required. In such cases, when, say, two secondary shoots have appeared, I cut the main shoot above the lower secondary. The white mildew is apt to denude a shoot except for its terminal leaves and the basal cluster, then possibly it is as well to cut to the basal cluster, and one ought to dip the sécateurs occasionally in Lysol or some other lotion, at any rate before proceeding to another tree; but I fear it is not often done. The treatment of the twiggy shoot ("brindille") will also give cause for thought. I have not tried the transfixion method,* in which the "downbend" is combined with piercing the stem between the third and fourth leaves with a budding knife.

Too early pruning rather tends to set back and delay growth, whilst if thorough woodiness has developed, the desired accessory growths do not appear so satisfactorily as when the condition of the shoot is just right; on the whole, I fancy it is better to be rather too early than too late on fully formed trees.

* Lorette, p. 177.

One objection that has been raised is that the method could not be adopted for commercial growth on the large scale, because so much time would be needed when other matters, picking &c., must be done. COUTANT reports that he commenced in 1913, after a year's trial on a small scale in 1912, to treat 20,000 trees on Lorette's system, that is to say two-fifths of his trees; though no doubt the war has interrupted the progress of this large scale trial, its inception shows what a Frenchman thinks possible with their alert workers, when a lad of seventeen years may be entrusted with the pruning of a couple of thousand Pear-trees.

Once training of stipulary shoots has been commenced, the tree should not be moved until the training is completed. I say so from experience of one in which the direction of stipulary shoots from another eye than that originally designed was rectified by careful transplantation, and at least a year was lost. There is tendency to form fruit blossoms instead of wood shoots, and the tree has to be wheedled back into growth.

CONVERSION FROM FORMER METHODS TO LORETTE'S SYSTEM.

Lorette considers that the interval of 30 cm. is too short to be allowable between main support branches, consequently these are to be cleared out so as to leave about 15 inches (40 cm.) or more in the case of 9 or 10 ft. pyramids. First of all, the tree must be left without any winter pruning; in the spring, superfluous structural branches are cleared out. In shortening the side branchlets, in conversation, M. LORETTE was very insistent on never leaving less than about 4 or 5 inches. After this cutting back, those new shoots which have become woody and as thick as a pencil are removed, whilst the weaker ones are cut back to three good eyes; this will be done about the end of May (Pears) over the upper part of the tree, and two or three weeks later, in June, over the lower part. In July, if two shoots have grown from two eyes having broken, the end one is removed and the lower one cut back below leaves with apparent eyes, given that a length of 9 or 10 inches has been attained. Personally I have been rather conservative and cut back side branches hard where there was no prospective fruit, and leaving parts with existing fruit to a certain extent for another season; my plan has been to avoid too much hurry in the conversion, and to use the "taille sur rides" in subsequent seasons, cutting to old fissured or wrinkled bark in May or June (Pears), up to August (Apples). The shock produced on a tree seems much less when heavy cutting is done in May onwards than when it is done in the winter. Having once made a good start, the subsequent procedure is as has already been outlined.

TRAINING PRINCIPLES.

Three main guiding features are insisted upon: (1) The distancing of support branches, (2) the use of shoots derived from stipulary

eyes; and (3) following from the latter, all pruning is done during active growth.

(1) *Distancing.*—Most writers on training only speak of or allow a distance of about a foot between main branches; thus the main boughs of a doubled U or of a horizontal palmette are put at 30 cm. in French and one foot in English works. LORETTE considers that it is important not to go below the minimum of 40 cm. (15¾ inches) for trees trained in the flat, whether in espalier or counter-espalier (*i.e.* against a wall or on supports in the open), whilst for pyramids, cones, &c., the distance advised is even greater (45 to 50 cm., or 17·7 to 19·7 inches). The intention is to give plenty of space, light, and air, and so to encourage fruit-production with avoidance of basal denudation. Moreover, he would limit the total length of support branches on a tree to a maximum of 20 mètres (65 feet); thus with a horizontal palmette of four tiers the length of branches would be about 7½ feet; whilst a higher tree with ten pairs of branches would give a length of 2½ feet for each branch. I am disposed to think that a limitation on these lines is probably good from examples with long side branches with which I have had to deal; incidentally, the higher trees are then much more readily got at with the ladder; the long extensions, sometimes formed to fill spaces far from the main trunk, tend to lead to denudation at the base.

(2) *Stipulary eyes.*—In order to evoke the stipulary eyes it is needful, first of all, to cut back in April/May the leading or other shoot of last year just above the eye where the new shoots are required. The end bud will break and give forth a shoot (figs. 38, 39, 40). When this has attained pencil thickness and is thoroughly vigorous, but not fully lignified, it is cut back, a short stump only being left. On either side, at the base of this stump, the stipulary eyes shoot forth; one however precedes the other, so that if both are wanted, as in forming a "doubled U" or a horizontal or Verrier palmette, they must be equalized by tying down the first and more sturdy one until the other has caught it up; it is rarely necessary to snip the leaves also, whilst another aid, if needed, is to make longitudinal incision through the bark of the weaker shoot in the following March. It will be seen that the two boughs come off at precisely the same level, so that once equalized there is no difficulty in maintaining equilibrium once it has been established; this is not the case when naturally occurring branches have been utilized for making so-called pairs. I need say no more in advocacy of this great improvement in technique, which indeed must be much less costly to install.

If the central stem is required, as in a Verrier or a horizontal palmette, two buds are allowed to break, the lower one being placed in front and at the level for the first pair of branches, whilst the upper one may have any direction; the two shoots at the lower eye are equalized for the first pair of branches, whilst of the upper pair only the second or weaker one is retained to continue the central trunk. In order to get the next pair of shoots in proper direction, this shoot

is twisted so as to bring an eye forward at the proper level, wherewith to develop the second pair of branches, and so on for further development. It may be asked, Why not allow the mid-stem to grow on naturally ? the reply to which is that the central stem must be checked to allow thorough development of the lower tiers before it is allowed to proceed, otherwise basal denudation is sure to occur ; the procedure also has the advantage of getting the more productive (as is claimed) stipulary wood for the continuation. I may add here that LORETTE advises the use of the weaker or second stipulary shoot for obtaining the main stem of the simple cordon and also for the main branches of the dwarf distaffs or "fuseaux." It will be noted that in many of these forms the eventual support branches are "doubly stipularized," if one may coin the phrase, as for instance is the case with the "doubled U." It is important that the maiden tree should be thoroughly well rooted before commencing operations, and if, as I usually find, growth is not good in the spring following plantation, it is better to await the next April, or more time may be lost. At planting the maiden, LORETTE advises a mere removal of the top few eyes : I am not sure whether it is not best to leave all alone. Where straight continuations are needed the pruning cuts should be made obliquely ; if only a U-form is being made the cut should be transverse for preference. In some cases M. LORETTE was developing his stipularies from a lower eye, as if a continuation was wanted, but the upper part was to be cut away, and was merely retained as a sap drawer ("appel sève") ; in the same way some shooting may be allowed below the chosen eye to draw sap for awhile ; these variations may be useful where growth is not strong enough, as I find often to be the case where maidens have not been planted for a good year. At any rate, in one case I have obtained direct growth of stipularies in a tree in its third year ; two sets broke without the central shoot. There is, of course, the risk that the eyes may have received damage without the protecting shoot base.

In these procedures only pairs of branches can be obtained, but sometimes one wants more branches at or close about one level, as in a "staged pyramid," for the natural branches are always so separated that the upper ones will always cause trouble and delay in securing an equilibrium, which indeed is never final. Curiously enough, LORETTE does not write of this in his book, and I cannot be sure in what author I found the procedure. The leading shoot is cut back to an eye at a level slightly below the point at which the branching is desired, the pruning cut being oblique to allow prolongation in line (fig. 41). When the shoot from the terminal eye is ready, and has a good basal cluster of leaves, it is cut back to one or two apparent eyes ; when these have shot well, a transverse cut is made to the basal cluster. The first cutting yields the basal cluster, the second throws nourishing sap into the latent eyes of the basal cluster leaves, and the third one causes them to shoot ; in this way one can obtain some five to seven shoots originating almost at one level, anyhow more so than can be done in any other way except by the insertion of grafts or

buds. A single cutting straight back to the basal cluster may sometimes succeed. One shoot may be guided upward for the continuation and others selected for retention and equalization as may be required. Botanically, of course, the leaves are not exactly at the same level, for they do not form a "whorl."

Results.—Of the results obtained by these pruning methods in M. LORETTE'S plantations there could be no question, and the figures in his book were no exaggeration of the prodigious fruiting of the trees when I saw them. The two old pyramids,* one of which had been submitted to the "Taille Lorette," were perhaps the most striking of all (fig. 42). From tentative operations on a few trees I have passed to treating practically all my available trees on the method, and am in course of training others. Other writers, as COUTANT and MOSER, have expressed their contentment; the former is treating 20,000 trees on the plan. All that one need say is: "Make trial on a few trees, and if all seems good, do more." It is particularly on trees that refuse to fruit, blossom, or that have a habit of taking holiday seasons, that trial may especially be suggested. Even if the whole scheme be not entertained, the application of the basal cluster cut is worth trial for gross wood shoots ("gourmands"), and is less work than the implantation of blossom buds. M. LORETTE told me that about a quarter of an hour was needed to trim one of his full-sized winged pyramids. In irregular growths such as are so common, bush and ill-trained dwarf standards, the pruning will be somewhat lengthy, if indeed practicable, until some law and order has been established. Certainly the development of dard and fruit-buds seems to follow the descriptions; and it may be observed how like a bourse or knob is the swollen basal part of a shoot after the cut to the basal cluster. I have already noted that practically any variety of Apple or Pear seems to be amenable to the system.

Quince Tree.—Of this I hardly like to say much, as I have been working rather in the dark upon three young cordons "en espalier" without any definite instructions from the master. The Quince bears on new wood and the shoots are devoid of a "basal cluster." The shoots when about 12 to 18 inches long have been taken back to the first or second leaf; where bifurcations occur the nearest shoot to the main stem has alone been left. Where cuttings are needed to prevent overcrowding and to let in light and air, a sap sucker is left until basal shoots develop. Blossoming has been good and free, but white mildew has caused a good deal of promise to "miff off" in an unpleasant manner. Repeated "lime sulphur" wash at 1 per hundred has perhaps saved the half-dozen fruits that have apparently become well set this season. My hope is to establish cluster blooms, like the "Bouquets de Mai" of the Peach, Plum, and Cherry; as also occur on *Cydonia japonica.*

Peach Tree.—Of these I have no personal experience beyond the inspection of M. LORETTE'S trees, which certainly demonstrated his

* *Vide* 2nd ed. p. 105.

contentions. Here side by side were trees on the 'classic' and on his system of treatment. In a few words he suppresses summer pinching entirely, and controls by snipping off some half to two-thirds of each leaf on the basal parts of the shoots (say about 12 to 20 or more inches) which are destined to bear next year. The tendency of premature development of secondary shoots is thereby prevented, and the formation of *cluster blossoms* ("Bouquets de Mai") is favoured. It may be noted that leaf-snipping on a less extensive scale is mentioned by Du Breuil. The formation of these cluster blooms is particularly desired by our friends across the Channel, and I have intended to treat a Morello Cherry on these lines, in the hope of getting it well furnished with bouquets and thereby reducing the labours upon it, but so far the intention has not been carried out. It will be noted that pinching tends to throw sap into the basal eyes and so provoke premature shootings. The two effects, namely, inhibition of the formation of premature wood shoots and abundance of blossom bunches which had formed fruit, were well shown on his trees. Inspection of old and unpruned Plum or Cherry trees shows that practically all the blossom is in the cluster form, and if these can be artificially favoured less work may be entailed for continued fruit production.

Gooseberries and Red Currants.—Usually these are pruned after the fall of the leaf. Lorette's plan, which I understand is sometimes practised in this country, is to do the annual pruning in the green directly after the crop is off, or if picked green when it would have ripened. This pruning, towards the end of July or early in August, tends to throw sap into the buds for next year's crop. The plants which I have treated are mostly "en espalier" on an east wall, and the plan adopted has been to pinch or break off all sturdy shoots when four leaves have become fully developed or six on weaker ones (excepting thin twiggy ones which are left); in July/August all side shoots are cut so as to leave one, or at most two, leaves; Lorette puts it at "a few eyes." In this way the thorns disappear as the wood gets old, and yet the buds continue to produce. The figures show that two years of this treatment have not depleted the bushes, fig. 43 shows the blossom on Red Currant "Comet," and fig. 44 shows fruit on Gooseberry "Telegraph." When training Gooseberries, it is important not to let subterminal shoots rob that which is the main leader—at any rate if indiscriminate forkings and branchings are to be avoided. The Black Currant might also receive its orthodox pruning about the same time.

Conclusion.—Whilst, generally, summer treatments are of value in a more or less subsidiary way, in that the trees are well looked over, and consequently any disorder or pest is likely to be observed, Lorette's methods, in which the visits are more frequently repeated and the trees thoroughly inspected each time, give an enhanced position for this point in fruit-growing.

Finally, I feel sure that you will all be full of hope that Monsieur

LORETTE and his daughter have been spared to carry on their work, and that their beloved plantations, which they have tended for so many years, will still remain as a monument to the Professor's industry and acumen. Situated as it is, just outside the suburban area of Douai, one can but fear the worst has or will happen to the trees.

APPENDIX.

Note on Nomenclature of Fruit-tree Parts.

In the English language there is no comprehensive vocabulary for the different parts of the various fruit-trees. True, we have the word "spur," but that is not very definite, and is applied to somewhat varying structures from the simple "lambourde," a single short branch terminated in a single bloom-bud, the multiple "lambourde," which has arisen from branching and forking of the "bourse" area of the simple form, to the clusters of fruit-buds on Cherry or Currant. For instance, in "The Fruit-growers' Guide" by J. WRIGHT (recent; Virtue & Co.), about the only distinction of parts given is a "short stubby shoot," which from the figure apparently betokens a long "dard"; of the important organ the "bourse" there is apparently no mention, not to mention other parts. I called attention* to this want of terms in the hope of arousing suggestions for an authoritative set of terms. "A New English Dictionary" by MURRAY and others and LITTRÉ'S French dictionary have been consulted for the following notes:

Basal cluster of leaves on a shoot.—*Cluster*: "things of the same kind growing close together, *e.g.* fruits or flowers . . . originally of grapes, for which the word bunch is now common." As an alternative "Rosette" has been suggested, but "(*a*) a cluster of organs or parts resembling a rose in form or arrangement, (*b*) cluster of leaves naturally disposed like petals of a rose . . . 1848. 'Scions short, terminating in a rosette of leaves,'" show that the continuation centrally of the shoot makes the term inapplicable.

Bourse.—Except for the use of "purse" as equivalent in WARDER'S translation of one of DU BREUIL'S works, and which does not seem very satisfactory, apparently the only one of English authors who have recognized the organ is J. LAURENCE,† who calls it a *knob*; I suggest that this word be re-established.

Coursonne (f.), *courson* (m.).—"Branche taillée courte par opposition à d'autres taillées longues; . . . bois qu'on taille tous les ans sur les branches charpentes de la vigne, et qui porte le produit de la bourre ou œil. Branches coursonnes, sur le pêcher, celles qui, placées sur la charpente, portent la branche à fruit de l'année," that is, those which have been pruned short. In books on fruit culture the word is used for fruiting branches of other sorts as well as vine and peach, which

* *Gardeners' Chronicle*, December 1914, p. 395, and again February 1915, p. 71, and July 1916, p. 14.

† *The Clergyman's Recreation* &c. 1716. *Vide* also *Gardeners' Chronicle*, July 6, 1916, p. 14—200 years later!

are intended to be given up to fruiting only, and which are pruned accordingly. LORETTE * uses the word in an unusual sense for buds not shortened artificially, and his figure 41 represents what other authors † call a "rameau à fruits" as opposed to a "r. à bois"; this author uses the phrase "branche à fruits" instead of "coursonne," whilst DU BREUIL ‡ uses "rameau" both for fruiting and plain shoots. In the foregoing essay I have used the words "fruiting branchlet."

Bouquet de Mai ("branche à bouquet") literally signifies one of the bunches of flowers on the Mai or Maypole. Cluster-blossoms, and clustered or bunched blossoms, or bloom-buds, give the meaning, but not the poetical finish of the French term.

Dard (pronounced "dar").—"Petit rameau du poirier d'un centimètre à 5–8 de longueur terminé par un œil conique, qui finit par s'arrondir et devenir bouton à fruits." In derivation a *dart* or *lance*, apparently from its sharp-pointed bud when dormant. For this an English equivalent is badly needed, and in the above essay I have used the word as it stands; if we introduce it as a legitimatized term, even with pronouncing the final *d*, it would perhaps be better than the word dart. Recently a writer in "The Fruit-Grower" was evidently in trouble from the want of this word which expresses the prospective but immature fruit-bud, without circumlocution. *Entaille* (or *cran*) is another useful word, meaning the removal of a small piece of bark, which might be rendered "notch"; qualified as high or low, according to whether the sap-flow to a given bud was to be favoured or diminished.

Taille sur rides is much insisted upon by COUTANT § and consists rather of a cut among the furrows or groovings of old wood of "coursonnes" rather than *to* them, whereby small adventitious eyes are made to break into dards. HARDY || gives May and June as the time for the operation in Pears, and May to August in Apples. COUTANT does this pruning in furrows shorter and more severely on Apples than on Pears: "De nombreux yeux se sont developpés à la base ainsi que des dards très bien constitués, ce qui fournira de véritables nids de fruits. J'insiste sur cette taille sur rides, qui donne des résultats merveilleux." It may be noted that the cut is made transversely.

Arcure and *Bouclage.*—Words for the bowing or bending down used by various authors, including LORETTE, especially for the twiggy branches or brindilles, might be taken from derivatives of *arch*, but for confusion with inarch, or of *bow*. But who would know how to pronounce it? *Buckle* is used rather of local bendings of plates which are said to be "in winding"; perhaps a compound word such as the "*down-bend*" would do to mark the distinct meaning without circumlocutory phrasing. Some other questions of ter-

* 2nd ed. p. 145.
† *e.g.* Hardy, *Traité de la Taille* &c., p. 57 and fig. 12. Paris. 13th ed. now current.
‡ *Op. cit.* 15th ed.
§ *Jardinage*, IV. June 1914, p. 362.
|| *Op. cit.* p. 80.

minology were dealt with in the *Gardeners' Chronicle*, December 1914, p. 395.

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WATER-GARDENING.

By R. W. Wallace, F.R.H.S.

[Read August 14, 1917; Mr. J. Cheal, V.M.H., in the Chair.]

Some of the most pleasing and delightful effects in the garden are associated with water in one form or another, and the great increase of late years in the love of gardening and all it entails has naturally meant the greater development of the water-side and water-surface wherever they are to be found. I do not propose to discuss the beauty of water in association with landscape, but rather the manner in which its beauty may be developed, if the surroundings are treated in the right spirit, so that the water and the surrounding vegetation are combined, the one helping the other to form a pleasing picture.

Generally speaking, the water in the garden may be classified as follows:

1. Where water is strictly formal, as when it is contained in a Lily pond or basin, of geometrical design, with fountain &c. As a rule, such effects are used as a central feature to some planting design.

2. An artificial pond of irregular outline, where, to obtain a natural effect, it has been necessary to concrete the bottom on account of the soil and situation.

3. An artificial lake made by damming up a water-course, or other means.

4. A natural pond or lake.

5. A river, stream, or brook passing through the landscape or woodland to be developed.

There are of course certain other aspects of the subject, such as the use of water in the Rock Garden, but I do not propose to deal with these to-day.

In introducing the question of formal water-gardens, and in fact artificial water-gardens generally, I fully recognize that I am treading on dangerous ground. May I preface my remarks on this division of the subject by quoting Mr. Wm. Robinson ?—" So far as our island countries go, nothing asks for more care and modest art than the introduction into the garden, or home landscape, of artificial water." It is a question whether much of the labour, time, and money spent upon the construction of artificial water-basins would not be better utilized in the development of what natural beauties the garden may afford. They are not cheap introductions, and unless the setting is good, and the circumstances favourable, they can be, and often are, dismal failures.

The most absolute failure of all is the so-called Lily pond or pool

that has neither water supply nor outlet. Such introductions are to be avoided in any design. The formal pond must be one in which the water can be kept pure and sweet by a sufficient and regular supply of water, and a drainage system that will permit of a current being passed through the pool as frequently as desired. Lily pools that have to be filled by hand or the garden hose are doomed to failure from the start. Those that cannot be emptied easily, at will, are little better. The water will be stagnant and filthy, and, unlike good gardens, aquatic or otherwise, will be less beautiful the older they get.

I make these remarks in passing lest I should be thought to advocate the making of holes in the ground, with or without geometrical design, lining them with cement, and calling them what they never are, and never can be, water-gardens. Too often they are merely breeding holes for mosquitos and other pests.

Do not think, however, that I am deprecating the use of artificial water areas in garden schemes. On the contrary, I am one of those who believe that no garden is complete that makes no provision for the cultivation of aquatic plants. There are, however, some gardens that have to remain without it by force of circumstances. Better let them remain incomplete than try to force the circumstances and merely emphasize the fact that the situation is an impossible one.

For formal water-gardens the circumstances I should characterize as satisfactory are:

1. A liberal supply of water available, in such a position that it can be turned on or off at will.

2. The pool should form a part of some larger garden scheme, such as a main or central feature in a flower garden, be it devoted to roses or any other plants.

3. It should be in such a position that it can be emptied quickly, and without any undue expenditure of labour, by an outlet valve.

4. It should be of sufficient area to achieve its object, viz. the cultivation of aquatic plants, and deep enough to meet their requirements. Finally, in design it should be obviously part of the garden, not an isolated creation that involves resort to all sorts of extravagance to justify its existence.

As an illustration of what not to do, I might mention one I know existing within ten miles of this hall. It is a circular pool, constructed on ground that is not level, in an expanse of rough grass, under the shadow of a group of Beech trees. The result is that it has an ugly bank above it on one side, sloping to its massive concrete edge. Below it is another bank, still more ugly, falling away from it. It looks more like the concrete surround of a disappearing gun platform than anything else I know. If anything were needed to achieve absolute absurdity, it is assured by a feeble squirt rising perpendicularly from the centre of the circle. So slender is the column of water that it is scarcely perceptible in the dense shade, and with the faintest breeze it is blown away and disappears altogether. It remains a lasting

(unfortunately) example of the futility of gardening by fashion book. Nymphaeas will not flower in shade, nothing will grow there successfully, and it is about as hideous a nightmare as the worst architect of the early Victorian period could well be responsible for.

But indeed the really successful use of water in the garden scheme can give the most delightful addition.

Picture a long garden vista, sloping away from a terrace. The eye travels on between flower borders rich with summer colour. From these a grassy walk passes on its way under a group of over-hanging arching Cedars. Beyond them, on either side of the walk, is felt rather than seen the glow of many Roses, for it is the path through the Rose-garden. At the further extremity tumbling masses of mingled Rose and Clematis fling themselves above and over the pathway in rare profusion, and on beyond is the silver gleam of water, not the strea or lake of which I shall speak elsewhere, but a spacious artificial Lily pond. All the way from where we are standing the gentle fall of the slope, crossed here and there by a few shallow steps, seems to lead naturally and easily to the water's edge and entices us into the pathway leading to it. Nor is there disappointment in store for us when we reach it. This is no dirty stagnant water, but a pool, clear limpid, and serene. On it float the most beautiful of aquatic plants, the Nymphaeas, and during the heat of a sunny day, there are fountain jets that can be turned on or off at will. It is for the cooling plash of the water in the heat of summer that these fountains are particularly attractive. On a cold grey day they are not necessary, and can rest. But there is an additional attraction in this particular pool. All around its edges are growing freely water-side sedges, reeds, rushes, and other moisture-loving plants. This is ingeniously arranged for, by introducing a series of marginal beds inside the coping of the pool. It is so designed that these beds are kept permanently moist. The method adopted is to build an inner wall that comes up to a point just below the water-level. The space between the outer wall and the inner is filled with soil, and thus forms a wet border resembling the edges of a natural pond or lake. Those who feel that the Lily pond as usually constructed presents a hard and forbidding edge, may try this method in the full assurance that the result will be surprisingly enchanting.

There is another delightful effect that comes to my mind. In a garden that I know, one leaves the house and soon enters a cool, shady walk between stately trees and ancient trimmed Yew hedges. A sudden bend in the walk and a gleam of sunshine and glowing colour attract the eye onwards, and there below is spread out a garden panorama that can in no sense be conveyed by words. An area sunk slightly below the surrounding level of the ground, and in shape a large rectangle ; the whole enclosed on three sides by high hedges of evergreen, and on the fourth the continuation of the path we are treading wanders away onwards through an enchanting woodland. It is indeed a landscape picture, for which the garden at our feet

seems to give us pause. But this garden is much more than an interlude, and I will try to describe it. Down three or four shallow steps and we are standing at the edge of a simply-formed Lily pool. There is nothing extravagant or ornate in its construction. The most simple of stone copings surrounds it. From this a wide channel some 100 feet long and 8 or 10 feet wide stretches away towards the woodland beyond. Upon the surface of the water are floating Water Lilies, Water Hawthorn, and a few other aquatic plants. On either side are borders of flowers, grasses, such as the Eulalias, the smaller-growing Bamboos, and the foliage of the Siberian Irises, giving a light and graceful touch. Here and there the plants in the borders have been allowed to escape and tumble in flowery profusion right down to the water's edge. Every point of view produces a new reflection. Some clear and sharp, some shadowy and indefinite, but all exquisitely beautiful. The whole garden, from the Water Lilies on the surface to the last flower in the borders, is in soft and beautiful tones—lilac, lavender, grey, pink, heliotrope and creamy yellow. Outside the borders on either side of the garden are paths formed of old and moss-grown bricks, and the surrounding level is retained by a low wall-garden full of Alpine flowers, and presenting a thousand and one miniature effects, over which one lingers with admiration. There is no sense in this garden as of the whole arrangement having been made for water effect, but it has to be recognized that without the water the garden would lose its attraction. That is the real place of artificial water in the garden scheme, one in which it is not obviously the main *motif*, but where, in its happiness of association, it is not obtrusively a water-garden.

Another point is to be emphasized. Never create large and expensive architectural embellishments out of all proportion to the area of water available. There are many such that are called pool-gardens, that would be better named stone monuments to inefficient gardeners or over-zealous builders. The keynote of successful water-gardening is its simplicity. In a formal design you must be formal in your water scheme: but this does not mean that you must be intricate. If you want a builder's exhibition in the garden, have it by all means, but do not make water-gardening an excuse for it. Ornament is justifiable if used in moderation and with restraint. Excess of it will ruin any water-garden effect.

I cannot linger longer on this division of my subject, though I should like to. I should like to scan the merits of the simple circular pools that form a centre for a Rose-garden design. In this the minimum of masonry is the most effective. I think a simple stone edge, moss-grown and grey, is the best, and just three or four of the best Water Lilies bejewelling the surface. Such pools can be very attractive, but we must now turn to the second section of the subject.

An artificial cemented pond or lake of irregular design is not always a pleasing feature, because of the hard outline which is very difficult to hide in a satisfactory manner; again, because of the diffi-

culty in planting moisture-loving and semi-aquatic plants around the edges. Generally speaking, the best effects are obtained by masses of shrubs, generally Rhododendrons and Azaleas, planted some way from the edge. Of course, in such a piece of water, Water Lilies may be grown very successfully. It is not, generally speaking, worth while to form an artificial piece of water, but if there is an overflow from some source to be dealt with, and the lie of the land suggests an expanse of water, then the construction is, I think, justified, especially if it comes well into the landscape from the house, and if it is suitably planted it should be an addition to the garden; but it is not a feature that appeals to me, therefore I will pass on to the consideration of sections 3 and 4.

3. An artificial lake that has been made by damming up a water-course or other means.

4. A natural lake and pond.

Where a water course has been dammed many fine sheets of water have been formed, and this can only be carried out successfully when the surroundings are such that the newly formed sheet of water appears to fit into the landscape naturally. Such water would always be found at the foot of a slope or hill. The planting around such lakes and those that are natural is generally of a bold nature—large masses of Rhododendrons and Azaleas for summer effect, and Scarlet Dogwood and golden and crimson-barked Willows for winter effect, are typical of much planting which in the past has been generally of an evergreen nature, and therefore rather sombre when the flowering season is over. Many of the larger-flowering shrubs and trees may be used to advantage, such as Viburnums, Spiraeas, Sambucus, Catalpas, Magnolias in moist sheltered corners, Liquidambar for autumn effect, *Cercis Siliquastrum* (the Judas tree), *Clethra alnifolia* (the Virginian Sweet Pepper tree), flowering in late summer with feathery spikes, of sweet-scented white flowers.

Good use may be made of the flowering Thorns and Sea Buckthorn, the native Blackthorn overhanging many a pond and beautifying it with its wealth of small white flowers in early spring, Weeping Willows, especially the golden form and the Silver Willow—*regalis*—and in a position sheltered from wind generous planting of Bamboos. In well-drained soil by the water-side a glorious effect may be obtained by an occasional planting of the Penzance Briar Roses. Many years ago I saw the variety 'Jeanie Deans' in flower at the edge of one of the ponds at Easton Lodge, 20 feet high, a mass of colour reflected in the water.

The larger-habited and bolder herbaceous plants are also suitable for large planting around lake sides, and from a number of suitable subjects I only mention a few. *Spiraea gigantea* and *S. gigantea rosea* will grow 15 feet high, their bold foliage turning to bronze and orange in autumn. The handsome foliage and flower heads of *Senecio clivorum*, the upright yellow spikes of *S. Wilsonae* and *S. Veitchianus*, are worthy of fine grouping, whilst *Eulalia* in big

masses, interspersed with clumps of Kniphofias and Pampas Grass, can be arranged in a fine setting.

For large lakes such as we are speaking of, good use should be made of the Rheums and Gunneras, the finest being of the latter genus *G. manicata.* Whenever possible, plant them on a tongue of land running into the water or an island, so that the bold foliage stands out plainly from its surroundings.

For a long distance effect the White Poplar, when properly grown, is a striking object of July beauty. The effect of a large tree against a dark background is as though it were a mass of burnished silver. The bat Willow (*Salix alba coerulea*) is of similar appearance, and of course is worth planting on account of its commercial value. The fine cut-leaved Alders and the deciduous Cypress should always be planted in conjunction with the water-side.

I have but briefly touched on the fourth section of my subject, and will pass on to the consideration of division 5, viz. A river, stream, or brook passing through the landscape or woodland, or a combination of both.

Positions such as these are full of possibilities, and it is upon them that I wish to speak most fully to-day. The opportunities for woodland gardening are endless and have been much neglected in the past. Assume for the moment that you have recently acquired a large or small area of woodland with a stream flowing through it, perhaps connecting a series of ponds; it may be more or less level or falling ground. You would proceed to clear away the tangle of undergrowth through which the stream passed, showing up the tree trunks here and there, and in clearings along the stream side plant masses of moisture-and-shade-loving plants, and where portions of the surrounding ground were fairly flat you could carry your planting masses well into the recesses on either side. When the ground falls sharply to the stream you will probably find small ditches acting as feeders to the main stream. Their surroundings should be all cleared and the small water-courses shown up. Then you can run lines of colour up the ditches on either side with, for example, such plants as Primulas in spring and early summer. Imagine for a moment standing below and looking upwards at a mass of many thousands of *Primula pulverulenta* grouped on either side of the small stream making its way downhill, and, as an irregular background to the Primulas, the woodland itself in all its fresh spring beauty. Or, earlier in the year, imagine the sight of many *Primula rosea* planted in similar manner, giving a vision of intense clear colouring, In May, long lines of Trollius would be seen, followed by the Panther Lily in July. Again, suppose a small feeder stream is descending through open meadow-land just where there is only a fringe of woodland. Here in the meadow you would plant *Iris sibirica, I. orientalis* 'Snow Queen' and 'Emperor' in many masses, and as you stood below in the half shade of the wood at the junction of the feeder stream with the main, looking up you

would see the countless spikes of the Irises bright in the sunlight and probably reflected in the water, whilst where you stood and all around you would be masses of Epimediums, Double Welsh Poppies, *Orchis foliosa,* Lady Ferns and Ostrich Ferns grouped with the beautiful plumose forms of the Aspidiums, and above them in the higher ground *Lilium rubellum* might be seen in flower and *Lilium Szovitzianum,* the white Martagon Lily, and fine contrasting foliage of Solomon's Seal and Plantain Lilies.

There is practically no limit to the planting that may be done in moist woodlands. Clearing must be done with care and skill, so as to preserve the best features of tree and shrub life, especially taking care of the Silver Birches—their graceful outline and foliage is so valuable. A small clearing by the water with Silver Birches a few yards distant will be made a delightful picture if the space in the foreground is planted with white and yellow Polyanthus. Again, in another clearing, where there is plenty of room, plant a tall golden Weeping Willow; then, in the latter part of April, it will be a cascade of pale gold, whilst at its feet masses of pale golden Trollius or *Primula sikkimensis* would fill in and make a perfect picture. In early spring great use should be made of the Wood Anemones, especially the sky-blue *A. Robinsoniana* and the newer varieties, *Alleni* and 'Vestal,' which are twice the size in flower with double the vigour of growth. In open spaces good use may be made of the blue and white Apennine Anemones; but here the ground must not be too moist. A good illustration of this suggestion will be seen in "Gardening Illustrated" for August 11, 1917.

It will be noticed that many of the plants named are not true water-side plants; but the point I wish to emphasize is that all plants look so much better when seen in conjunction with the stream or water's edge. Walking through the wood and looking across the stream from time to time at masses of plants growing in close proximity, the water will give added life to the picture.

So far our remarks have only referred to the small stream passing through the woodland, but more often than not these streams lead to a pond, and should such a position occur it is best to deal with it carefully, clearing out around the same and forming one or two long vistas throughout the woodland, so as to make the pond the central feature. Let the principal vistas be fairly straight and not serpentine, because, above all, you want to see into the woodland and get the distant effect of light and shade. In forming such vistas an occasional fine tree trunk or group of stems makes a splendid termination or a centre for tracts to cross. On either side of the green ways there must be informal groupings or planting, saving what is best of the natural growth and adding to it. Free growing roses in informal masses, such as 'The Garland,' 'Carmine Pillar,' 'Una,' Penzance Briars, &c., which only require a little thinning and cutting back, will form large mounds and, running up adjacent trees, cascades of flowers. Clematis of the Montana type and Flammula and Viticella

forms may be similarly used. I would have the planting of the broad vistas dealt with in a bold way, using large subjects and plenty of them, and then from these broad vistas many smaller paths, which would lead to the quieter parts of the wood, such as a group of Silver Birches or Scotch Firs that stand in a small clearing. Here all around I would mass many of the beautiful forms of Azaleas, Lady Ferns, Polystichums, and many others, amongst them Foxgloves and occasional Mulleins and a few Lilies, such as *Szovitsianum* and *giganteum*, *regale*, etc. There will be colonies of Cyclamen both spring and autumn, and on one side a low carpet of *Gaultheria procumbens*, from which would rise the taller *G. Shallon*, Honeysuckle in masses, and perhaps one rose in a tangled mass of beauty from behind a group of *Cytisus praecox*, carpeted with the double lilac Primrose long past its beauty. I notice I only mentioned the English ferns, but one must also use freely by the stream side some of the North American species, such as *Onoclea Struthiopteris* (Ostrich fern), *Osmunda Claytoniana* (the Crozier Fern), and *Osmunda cinnamomea*, not forgetting our own Royal fern, and the hardy Canadian Maidenhair (*Adiantum pedatum*). Associated with the ferns in the drier spots can be used freely the North American Trilliums and Dog's-tooth Violets, all of which will beautify the ground amidst the ferns and help to make a picture with their unfolding fronds. I know of no finer plant for individual effect in the open moist woodland than a colony of the blue Himalayan Poppy (*Meconopsis Wallichi*). Choose a position fairly damp, where the woodland is thin and yet affords shelter from wind, and here you may plant it, and from the day its foliage begins to form until possibly eighteen months or two years later, when the stem has developed to a height of eight feet or the last pearly blue flower has faded, it will be an object of beauty. The effect of many spikes of shimmering pale opalescent-blue flowers and the foliage on damp days studded with drops of water like diamonds is irresistibly lovely. If your woodland stream should by any chance pass through peat, then great will be your opportunity with such glorious plants as Kalmias, Pernettyas, Andromedas, Epigaea, Shortia, Schizocodon, Galax, and hosts of other peat-lovers.

I have so far dealt with water in the woodland and some of the many forms in which it is generally seen in gardens. When I say dealt with—I have only just touched on the various phases of the subject, as it is impossible to deal with them all completely within the limits of a single paper. But there is another aspect of water-gardening, and one on which I wish to lay particular stress. That is, the possibilities of development regarding flat meadow-land adjoining a water-course, and through which a tiny brook or small canal finds its way to join the main stream. By merely diverting this small feeding stream and digging out various channels and widening them at intervals into larger pools, we soon have a network of small pools and water-ways all set in meadow-land capable of much fine planting. Such a flat

piece of land might well join the woodland we have just been contemplating; and passing from the wood we find ourselves in what was once a meadow unrelieved by any planting, but now presenting a picture of slow-moving streams with their banks clothed at intervals with slender vegetation rising in soft outline, widening here and there into pools on whose surface are floating many-coloured Water Lilies; the skyline broken by the planting of Willows, whose graceful habit and soft colouring give an indescribable charm to the landscape. Here in these surroundings much planting can be done. Should there be any great expanse of water, places could be found for the giants of the water-side, such as the large-leaved Gunneras and Rheums, the semi-aquatic Reed Maces *Typha latifolia* and *T. angustifolia*; the giant Reed *Arundo Donax*, which I have seen in September 16 feet high, and a few of the graceful Bamboos, Eulalias, and many others.

Mention has already been made of the value of the Willows. They serve to give a height to the landscape and softness of outline. *Salix vitellina aurea pendula* should be planted freely, for a more beautiful tree in spring I do not know. The drooping branches seem to be involved in a mist of golden rain. The weeping White Willow is very beautiful, and possesses a picturesque outline of growth peculiar to itself. A few bushes of the Silvery-leaved Willow, *Salix regalis*, make a pleasing change, as does also the Rosemary-leaved Willow. Two dwarf Willows, used mainly for clothing banks and filling odd corners, are *Salix purpurea nana*, very pleasing in its purple stems and dense fine foliage, and *Salix sericea pendula*, with its downy grey-leaved procumbent stems reaching out over the water. The cut-leaved Alder (*Alnus laciniata*) and the similar foliaged *Sambucus tenuifolia* are both to be noted as fine. In reeds and rushes we have many fine plants. The large Typhas I have already mentioned, but you cannot do without the slender *T. stenophylla* and the tiny *T. minima* with its curious globe-shaped mace. The wild rice (*Zizania latifolia*) rises high in a corner with its Iris-like foliage, the rustle of which is always distinctive. I have never seen it in flower, though in September the tall spikes with handsome polished green stems begin to lift themselves, but never develop fully on account of the lateness of the season. Among the smaller-growing inhabitants of the water-side, both semi-aquatic and otherwise, will be found the sweet flag (*Acorus Calamus*)—how few know the fragance of its leaves!—and the Japanese variety, with its finely variegated foliage; the beautiful native flowering rush, with its pink cup-shaped flowers borne in umbels, the Galingale (*Cyperus longus*), a most distinct and ornamental plant at the water's edge, which, with its tall, slender, and aristocratic foliage (if I may use such a word in these democratic days), terminates in a spiked inflorescence of green and brown; the Bog Bean (*Menyanthes*), which reaches out over the water's surface and whose grey leaves and pink flower-heads form such a delight. I cannot mention everything, but we must not overlook the Giant Buttercup (*Ranunculus Lingua grandiflorus*), with its free growth and tall spike

of yellow flowers, possibly the best of all water-side plants. Nor must I omit the water Forget-me-not. Along the banks of the smaller and narrower streams much effective planting can be done by the use of the lesser-growing bog plants in broad masses, with occasional planting of larger-habited plants. In such plantings will be found masses of Mimulus growing and flowering in greatest profusion, such as *luteus, cupreus, Berneti* particularly effective, and 'Brilliant,' which is so beautiful in its dark colour and dwarf habit. The King Cups (Calthas) are fine in spring, particularly *Caltha polypetala.* Primulas, of course, are there in many colours. On the shady side particularly fine is *P. sikkimensis* and *P. pulverulenta,* and its white variety 'Mrs. Berkeley' in half shade against a dark background; and, later in June, the golden *P. Bulleyana,* which will be a mass of many hundred spikes three feet high, in a moist and partially shady clearing. Then we have all the seedlings arising from the crossing of *P. Bulleyana* and *P. Beesiana* in all shades of pink, orange, scarlet and pale lilac—a wonderful race; and I look forward to when we can grow *P. Littoniana* as George Forrest first saw it, in moist grassland alive with a thousand scarlet-tipped spikes. Lastly, we have the new yellow *P. helodoxa,* easy to grow and early in flower, the clear colour of its flower reminding one of a Daffodil. *P. vincaeflora* will also do in moisture. The purple *Orchis foliosa* and *O. maculata superba* will be in happy surroundings growing close to Epimediums, which latter are highly prized on account of their beautiful foliage, falling right down to the water's edge. As taller occasional plants, we cannot do better than make free use of the Irises of the Sibirica group, particularly 'Snow Queen,' and *I. Delavayi,* and our wild English water-flag and its primrose-coloured form. Of the newer grassy-leaved species we have forms of *I. Wilsonae, I. Forrestii,* and *I. Bulleyana,* all free-growing and very distinct, the yellow of the two first being most valuable in their sections. I must not overlook the deep Royal purple *I. chrysographes,* a gem of colour, though very fleeting: and smaller-growing Iris for the main stream are *I. albopurpurea,* a mass of China blue and white, *I. laevigata,* of distinct habit and dark-blue colouring, and its white variety; and the tiny *I. gracilis,* which does very well in half shade.

One could go on at great length, but a list of names will only weary.

I will now draw brief attention to some of the bolder-growing herbaceous plants which thrive amongst moist surroundings. Allusion has already been made to the Astilbes, and these, together with the Spiraeas, form, I think, the most important group we have: easy of growth and increase, free-flowering, they are indispensable during the summer months. The unique crimson colour of *palmata* is superb, and when well established this species reaches 3 to 4 feet in height. Tall plants of fine stature and superb foliage to be seen from a distance are the white-flowered *S. gigantea* and its pink variety, and *S. venusta,* with 6 to 8 feet high spikes of soft rosy-pink flowers. These two Spiraeas may be well grouped together with *Gunnera* and *Senecio*

Clivorum at some distant point seen across the water, and I might also add *Rheum palmatum* for early effect. The introduction of *Astilbe Davidii* has given rise to a number of hybrid forms partaking of the strength of *A. Davidii*, but with a more subdued range of colour. Some of the best are: 'Salmon Queen,' 'Cream Pearl,' 'Venus,' and 'Vesta,' forms which have given quite new colours to this genus, whilst the still newer 'Queen Mary' and 'Rubens' are two grand forms, the former being brilliant rose, whilst the latter is a particularly soft shade of pink.

Astilbe grandis, one of Wilson's Chinese plants, is delightful in its early growth: the ruddy tinted stems covered with hairy growth contrasting effectively with Trollius in creamy shades close by. In fact, many of the Astilbes are worth special grouping on account of their foliage in the young state, which acts as a delightful foil to such plants as already mentioned, Trollius, Double Welsh Poppy (which is splendid by water), Mimulus, &c. Bocconias are fine in foliage and flower, especially when escaping late frosts. Lythrums, especially the variety 'Rose Queen' and *roseum superbum* (I saw a real soft pink seedling the other day, a colour much wanted), also *Eupatorium purpureum*, a unique and handsome plant, whose fine tall heads of flower are very effective from a distance. I noticed a few days since a grouping of the *Eupatorium* and *Senecio Clivorum*, and the cream *Artemisia lactiflora* against the silver-grey Rosemary-leaved Willows—a charming effect of purple and orange, cream and silver.

So far in these remarks I have omitted all reference to what I think may be called amongst hardy plants the chief glory of the water garden in July—the Japanese Iris (*Iris Kaempferi*).

There is a general desire to grow these fine plants, and having been particularly successful in their cultivation, I may perhaps refer here to what I regard as the main conditions for success. They will do well in any well-worked soil and that which is rich in vegetable matter, but avoid planting in heavy clay by water-side. On meadow pasture land along side ditches and small ponds, planted just above the water line, in soil that has been well dug and manured, they will thrive splendidly and often seed themselves about. Another point, division after flowering in August is best. You will find in early autumn quantities of new roots pushing, so that by early planting you gain all this new root action. Again, in February countless fibrous roots are pushed out. This is the time to mulch freely, and about May dam your ditches if possible and flood freely. Division of the clumps every two or three years is good, and planting in fresh soil: such greedy rooters quickly exhaust their surroundings. You may say, "Why take all this trouble?" Well, if you do you will have foliage over 3 feet in height, and spikes 4 feet high, five to six on a clump, and your water-side and ditches will glow with colour, huge flowers more like gigantic butterflies just poised, and such a combination of colours as I think are not to be found in any other plants. One more point: always plant in fullest exposure in the sun; remember

they cannot have too much water in the growing season, but when at rest, as little as possible.

To those of you who have not been to Japan I recommend a study of Miss Du Cane's pictures in her book on "Japan." From this you will learn that one of the most effective ways of planting this glorious Iris is near to any low stone bridge crossing the water; massed on either hand, they seem to invite you amongst them. I have just referred to crossing the water with low stone bridges. Long broad flat stones placed just above the water surface and crossing your narrow stream at intervals, or the use of stepping-stones or both combined, are fine features in the water garden, and always at such crossings group at either hand, as has already been suggested, *Iris Kaempferi*, tall reeds, and rushes. These, when rightly placed, and not too many of them, give you that necessary feeling of support, and seem the natural finish to the bridge or stepping-stones.

Mention has already been made of some of the semi-aquatic plants growing by the water's edge. How incomplete the water-side would be without them! How graceful they are, and how they seem to enjoy the water; what coolness and comfort they suggest! The Vision of the great prophet Isaiah points out that the resting-place for tired humanity shall be "grass with reeds and rushes."

You must include in your water-ways the true bulrush (*Scirpus lacustris*), the reed maces from the giant to the smallest variety, the porcupine and the twisted rush, the sweet-scented Flag Acorus, the Bur reed, *Sparganium*, the Arrow-heads, especially the double white, the Golden Club with its curious unfinished-looking flower, the Bog Arum, and our native Flowering Rush and Bog Bean (two beautiful plants), and the water Ranunculus and the yellow *Villarsia*. One word of warning: all the above are rampant growers, and must be kept in check, otherwise they will quickly choke your water-courses.

So far but little mention has been made of the beautiful new hybrid Water Lilies. No water picture is complete without them. The majority are of easy growth, and quickly increase when once established. There are many varieties, but a few will suffice. The white *Gladstoniana* is a noble flower quite unsurpassed, and of pale pinks *Marliacea rosea* and *Colossea* are indispensable. In deeper shades of pink we have 'W. B. Shaw,' very free and sweet-scented, 'Masaniello' and 'Formosa,' and the glorious pink 'Mrs. Richmond,' quite unique in size and colour, the rose-pink 'James Brydon,' Marliac's masterpiece, the glorious ruby-red 'Escarboucle,' and 'Wm. Falconer' of deeper colouring. 'James Hudson' is very free and of a rosy crimson; the pale yellow *chromatella* and *Moorei*, of a deeper shade, a better plant. This short list I have given contains all the best growers and finest colours. Any pool, stream, or lake without their glorious flowers floating on the surface is incomplete.

I fear that my remarks on the water-garden have covered too wide a range. It is to me a garden full of interest, from the early days of the King Cup in March until the end of October, when the

autumn effects are slowly dying. All through the months of April and May fresh pictures keep forming and fading, and then in July it reaches its zenith. The light and reflection in the water aglow with many-coloured Water Lilies, all around masses of Astilbes, Spiraeas, and *Iris Kaempferi* in full beauty, the Giant Ranunculus, and the blue water Hyacinth and Forget-me-not; and over all a note of fullness and richness and, in spite of the summer heat, a sense of delightful coolness.

I urge all who can to develop the opportunities that any water in the garden presents to the fullest extent. Even the ugliest and straightest ditch with a little water running through it, with slight alteration, can be made a thing of beauty all the growing year.

In bringing my remarks to a close I am only too conscious that there is much more I should have said, and perhaps much of what I have said would have been better unsaid. The subject is so vast and it is so difficult for the inexperienced to convey the visions of beauty that he himself sees and often fails to paint in words. However, if in any small measure my remarks are found helpful, then I shall be satisfied. The subject is vast and knowledge is limited, but the more we endeavour to help others to a better understanding of the beauties of Nature, in the same degree we shall be helped ourselves.

PERGOLAS.

By Mr. EDWARD WHITE.

[Read Oct. 23, 1917; Mr. E. A. BOWLES, M.A., V.M.H., in the Chair.]

THE early history of pleasure gardens refers to countries in which the summers were excessively hot and where it was imperatively necessary to provide shelter from the fierce sun.

For the purpose of affording leafy shade no plant could be more serviceable than the pliant and luxuriant grape vine, and it is to this no doubt that the pergola owes its origin.

The device of the pergola is very ancient. It is illustrated in old Chinese records, and we even find in Egyptian hieroglyphics representations which suggest with sufficient accuracy the form of the pergola of to-day. What is in effect the cross-section of a vine-clad pergola occurs as a decorative theme in many ages. Examples are found on friezes unearthed from the ruins of Pompeii and Herculaneum.

In the references to gardens made by ancient classical writers emphasis is almost invariably laid upon features designed to afford shade. We find that trellises of fruit trees and vines were employed to temper the sunshine in Roman gardens. Much later, but centuries before the general introduction of pleasure gardens in this country, pergolas and pavilions, tunnels and arched hedges were common details in the gardens of Italy.

Mr. INIGO TRIGGS, in one of his excellent books, quotes Crescenzi, the Italian garden designer of the thirteenth century, who wrote of his pergola of vines as follows: "As in trees of this kind shade is sought rather than the fruit, they must not be too dry, and care should be taken that the trees be neither too many nor grow too thickly, because the shutting off of the air corrupts the health of the place; also because the garden requires a free current of air."

That was written nearly seven hundred years ago. In the Renaissance gardens of Italy, a century or two later, pergolas attained the zenith of extravagant elaboration.

In our country the sun is regarded as a benevolent if somewhat elusive deity rather than as a despot. There are times, however, when it sees fit to exert relentless power, and for such occasions shady retreats are gratefully welcomed in the garden.

The history of the pergola in England is very fragmentary. It is linked up with that of trellis arbours, gallery walks, pleached alleys and the like, which from early Tudor days onwards have been familiar features in fine gardens. There was little difference in intention between the old gallery walk and the pergola of to-day.

The Hon. Mrs. EVELYN CECIL, in her "History of Gardening in England," says that "such galleries were marked characters of late fifteenth and early sixteenth century gardens, designs being found in some old works, notably in the "Hortus Floridus" of CRISPIN DE PAS (translated 1615).

"They existed in Hampton Court before Henry VIII. made his alterations there, and are referred to in Cavendish's metrical life of Wolsey :

> 'My galleries were fayre both large and longe
> To walk in them when it liked me best.'

No single example of one of these original galleries or arbours appears now to be in existence, the explanation being that the pillars were made of perishable material and not of stone as in Italy.

"Few if any examples are to be found in English illuminated books, although plenty of pictures occur in foreign MSS. of this period, especially French and Flemish."

The one, and as far as I know the only, book in England devoted to this particular subject is SMITHSON'S "Book of Pergulars," published early in the seventeenth century. The word "pergola" was formerly used chiefly in the significance of the Latin *pergula*, meaning a shelter or bower, rather than to describe the leafy garden corridor which now monopolizes the term. The expression pergola is noticeably absent from JOHN EVELYN'S outline of the *magnum opus* on garden art which he projected but did not write. Every other conceivable garden feature seems to be named in the detailed summary of the work which he prepared. Evelyn uses the word elsewhere, however.

The great revolution which overwhelmed gardens in the eighteenth century would have been scarcely practicable if shade had been an imperative condition in the enjoyment of an English garden. The climate did not avail to save from destruction any of the shade-giving features which favoured formal design. The system of gardening which succeeded and remained in vogue for a century or so, in which straight lines found no place, offered little opportunity for the pergola. An important outcome of informal landscape gardening, however, was the stimulus given to the production and discovery of new trees and shrubs, and the interest developed in individual plants. These naturally included many fine climbing plants needing some special means of support.

This requirement has been met in the type of garden architecture evolved during the last quarter century, in which the pergola has been so justified that it is now as securely established in English garden design as if the shade it gives were an indispensable necessity.

But it should be remembered that the *raison d'être* of a pergola is to provide a shady walk, or, at all events, to afford shade where desired, and it should consequently be placed where this purpose is best served in the scheme of the garden. The most obvious position is a straight, exposed, and frequented thoroughfare. A pergola

FIG. 45.—IN THE GARDEN, MORETON PADDOX, WARWICKSHIRE.

[To face p. 292.

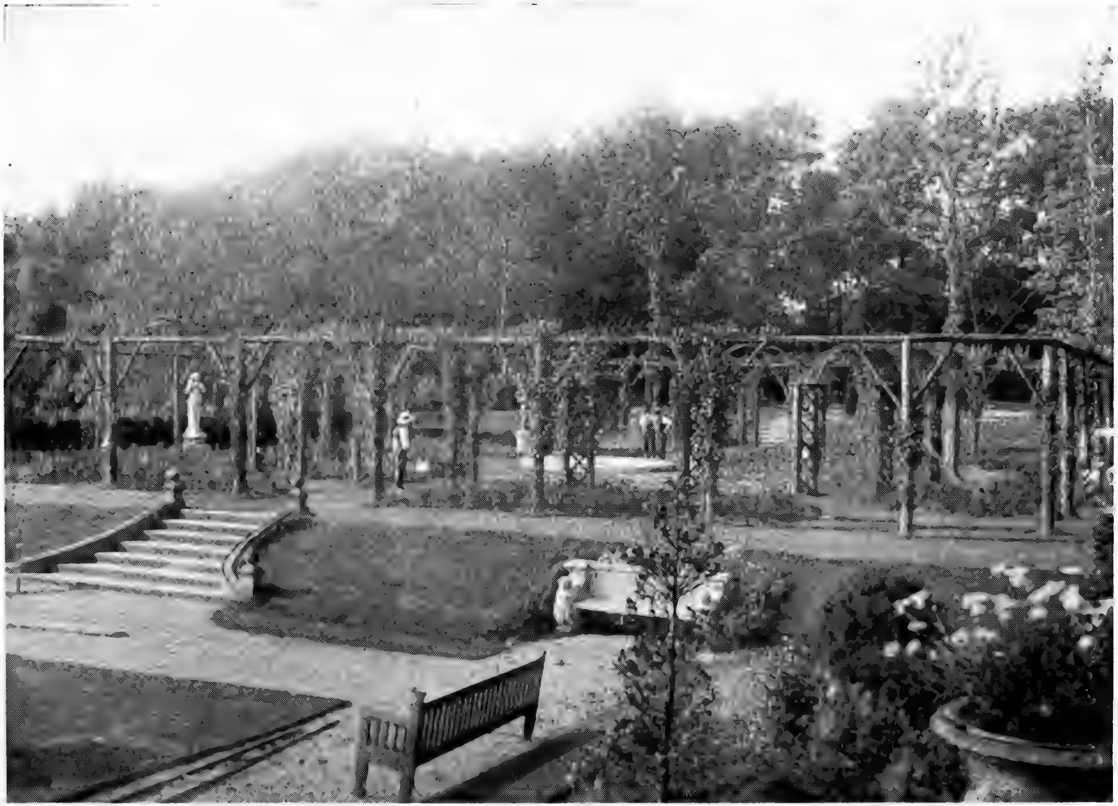


FIG. 46.—PERGOLA AT MORETON PADDOX, WARWICKSHIRE.

FIG. 47.—A PERGOLA AT MARDEN PARK, SURREY.

FIG. 48.—THE END OF THE PERGOLA AT MARDEN PARK, SURREY. [To face p. 293.

cul de sac should be generally in some part of the garden convenient as an arbour. A pergola should not be placed where it is of little use from the practical standpoint.

However charming it may be, and however liberal its wealth of flowers, it does not follow that the addition of a pergola to the larger garden pictures is necessarily good. It may be quite otherwise unless it forms part of a considered composition. If this is true in respect of an entirely new garden, it is clear that the addition of a pergola to a well-designed old garden needs very careful consideration.

We may compare this feature in some respects to an avenue of trees. Like an avenue, its main effect is to emphasize a certain line, and where such importance is bestowed, it must be rewarded by a satisfactory ending. If the eyes or footsteps are conducted to a point of little interest one feels that effort has been wasted. The line should be preferably straight, although a good effect is sometimes obtained by a regular curve. The sides should be free from continuous planting, by which one does not mean flowers. The pillars should be considered as belonging to the pathway and forming part of it. The material used for the latter should therefore be carefully chosen in order that it may appear to bind the piers together, and so assist the sense of unity and repose.

The appearance should be substantial and comfortably permanent in effect, but the grace of some pergolas is sometimes compromised by too heavy piers. Seclusion and quietness are desirable for pergolas intended to be used as arbours. A pergola should not unnecessarily monopolize the garden landscape, although it is sometimes a useful device for masking the poverty of an outlook.

When a pergola is placed on the central axis of a garden view the garden is cut in half, and this should not be done without full justification.

The effect of colonnading has an artistic value which is unique in architecture, and is independent of style. Partially clothed columns of a pergola with beams overhead bearing foliage of varying density lend themselves to unending experiment in perspective, and in the play of light and shade. These are factors of too much value to be left to chance. Those who derive great enjoyment in a garden by discovering every picture it has to offer, will always pause on the threshold of a well-made pergola in anticipation of the pleasing effects of the lights and shadows. The management of these effects is a difficult art, but the material with which one has to deal—the branches of the plants and the foliage—is amenable to discipline.

One understands and appreciates the importance of perspective effects in the corridors of a house. A pergola offers opportunities of equal value, which, rightly used, dispose of a not uncommon suggestion that it is chiefly worth seeing from the outside.

From an architectural standpoint the pergola is often very useful as an aid to composition and a means for giving variety in outline, continuity, connexion, and other characters which it is desired to

accentuate. It is specially important as a means of unifying the house and garden.

In fixing a position for a pergola, therefore, one has to consider its practical utility as a shady walk, its relation to the house, and its influence upon the principal garden pictures.

A garden which is well planned generally offers at least one position for a pergola. The most common opportunity lies in the extension of a terrace walk terminating in a garden house or arbour, or working up to some climax at a change of axis.

Picturesque effects may be obtained in the fashion of the old gallery walks, by completely enclosing the sides of a formal garden, a Rose garden, or croquet lawn, or some such symmetrical feature. A tennis lawn should not be so enclosed, as the light is spoiled for playing. An ugly wall may often be transformed by building a pergola against it. Appropriate situations are easily recognized and are generally available, and wider opportunities may be created with the aid of a little imagination.

A pergola is too rarely associated with water, in which the reflection gives such delightful results. Instances may be quoted of a straight canal flanked by pergolas and connected at the head by a bridge pavilion, of a large pool encircled by a pergola with a fine fountain in the centre, of a square pond with arbours at the corners linked together by pergolas. A charming view has been presented by a pergola flanking a pond sheltered by a wood and leading up to a boathouse.

At Marden Park, Surrey, where the slope of a hill was retained by means of a high brick wall, a probable eyesore was transformed by the addition of a pergola. A balustrade which protected a walk at the top made an unusual and effective addition.

A pergola is generally well placed where it overlooks a wide view at the summit of a series of terraces. A note of character is given to one from which the ground falls on one side, affording opportunities for dry walling and steps.

A pergola of considerable length is generally improved by variation in what one may call the roof lines, by a domed section, for instance, over a part arranged as an arbour.

When the relation of a pergola to the garden scheme is decided, one has to consider the design and details of construction, and subsequently the important question of planting. If the pergola is associated with the house or some other building, the design and materials should be in architectural agreement. Timber uprights are at times quite appropriate to such conditions.

A special essay would be necessary to deal with all the architectural possibilities and problems of the question. I will not attempt more than a few general remarks on the subject.

The degree of refined workmanship is decided by the style of the house, but the material may be more roughly worked. Columns may be built of many kinds of material, building stone, bricks, roofing-

tiles, concrete, and so forth, in addition to wood. Ironwork is not altogether desirable, but it is possible to counteract the effects of contact between the metal and stems of plants by tying on wooden fenders. The occasional practice of buying marble or other such columns from a dismantled mansion for use in a garden is not to be recommended, except for very unusual circumstances. I know three people who have such columns, bought on impulse, and never used.

Roughly sawn Oak and Teak are the most suitable timbers for columns. Larch of sufficient size is good for rustic work. Scots Fir and Spruce are not lasting. Those pergolas which collapse as soon as the plants which clothe them are arriving at perfection prove a great disappointment, as is one which has to be painted at intervals, and needs stripping for the operation.

It is not worth while to elaborate the architectural details of stone or brickwork intended largely to be covered with foliage. As, however, the columns should be left exposed to an appreciable extent, the colour and texture of the material are important considerations. Needless to say, they must be handled in a craftsmanlike manner.

Common stock bricks are ugly in shape and size, and very often in tone, and their unnecessary use has often given to a well-planned pergola a commonplace appearance. The pleasant tone which is so much admired in old Tudor bricks may be reproduced by employing selected hand-made English bricks of small size. These are procurable in a soft red colour, which tones well with a warm purple brick, skilfully blended. Delightful effects of light and shade are given by such bricks and accentuated by building with wide mortar joints.

In districts in which building stone can be obtained local material is generally used. Excellent results are produced by thin laminated stone with rough edges and surfaces, built with the mortar joints well set back, after the fashion of dry walling. A good deal of ingenuity is sometimes expended in making patchwork of local material bricks, stones, tiles, concrete and such like. Such work needs to be done by a craftsman, with a sense of unity and complete mastery of material, otherwise a laboured and affected appearance results, which is exactly the opposite of the intention. Good work may be done with concrete (sometimes rough casted and tinted), with roofing tiles, fused red and purple brick burrs, and various other building material.

The piers of a pergola are required to sustain the combined burden of the wooden beams and the planting. The business of the beams is to tie together and strengthen the piers, as well as to carry the planting. The piers and timbers must be strong enough for their work, but if they are disproportionately large they will look clumsy. Heavy work is occasionally needed for architectural effect, and it may also be justified by the considerable length of a pergola. Otherwise the effect is more graceful if the material appears just comfortably strong, and no more. This is especially the case in respect of circular

piers. One must, of course, concede something to the semblance of weight in a great mass of foliage.

The following dimensions may be taken as a working average :—

Brickwork piers, 14 inches square ; stone piers, 18 inches, varying with quality and size of stone ; solid circular stone columns, 12 inches diameter ; Oak or Teak uprights, 11 inches square. These are calculated to carry 10-inch by 8-inch longitudinal timbers, and 7-inch by 5-inch transverse beams. The piers are assumed to be 12 feet apart lengthways, 8 feet 6 inches high, and 10 feet from centre to centre in the width of the pergola. These are suggested as minimum dimensions where considerable strength and permanency are desired. The size of the timber may perhaps be increased to advantage so far as appearance is concerned.

The importance of sufficient width cannot be overrated—it makes the whole difference to the comfort and consequent enjoyment of the pergola.

It should be taken as a rule that the breadth should exceed the height, and the distance of the piers lengthwise be greater than the width. The length of the pergola naturally affects the proportions throughout.

Needless to say, the piers must rest on firm foundations. Timber uprights should be charred or treated with preservative. The longitudinal beams may be built into the top of the piers, and the cross-pieces should project a foot or so over the sides. It is also better to cut the latter with an upward curve in the middle, as straight transverse beams seen in perspective have the appearance of sagging in the centre.

I should feel inclined to disregard the well-discussed question of planting if it would not savour too much of "Hamlet" without the Prince.

In addition to the great number of climbing plants available, many shrubs of pliant habit are quite suitable for use on a pergola. The field of choice is therefore so large as to be confusing unless some clear principle of arrangement is followed. Most climbing plants when really happy make up in luxuriance what they lack in backbone. Overcrowding leads to a muddled effect, and it is better to exercise restraint in planting.

Many climbers are so pliable that with proper care they can be trained almost at will, and the form of the pergola can either be defined or a massed effect produced where the composition of a picture so requires.

Every pergola should have some individuality of its own, but its first duty is to play its part in the larger views of the garden. If it can simultaneously score some good side effects in conjunction with neighbouring planting details, so much the better. The interior of the pergola belongs to itself, and if happily treated will quite dispose of the fallacy that a pergola is only worth looking at from the outside.

The desire for great masses of colour is rather overdone. I think it is a mistake when a pergola occupies a prominent position to limit its reign of glory to a comparatively short burst of Rose bloom. If other plants are also introduced in which the tints and texture of the foliage are considered, the sum of the season's enjoyment is considerably increased. Density of foliage at calculated points is important in producing effects of perspective, and the flecks of sunlight and bars of shade on the pergola floor give character to the interior. A heavy evergreen at the entrance will make an inviting contrast with the outside glare, or a good result follows the planting of a rampant climber, such as a vine, which will sprawl over the first arch and clutch also at some architectural feature to which the pergola is keyed. Planting which helps to unify a pergola with its surroundings serves a good purpose.

I remember an instance in a Devonshire garden where a sturdy Fuchsia was growing on a pier and looked as if it had stepped from a large adjoining group of these shrubs to make acquaintance with the pergola. Through the arches of the latter one saw a bank of Heather sloping to the foot of the piers. The pergola was planted almost entirely with claret-leaved Vine and reddish-purple Clematis. A pink Rose or two and the large mass of Fuchsias close by gave the whole thing a very warm and comfortable effect.

It is scarcely necessary for me to re-enumerate the many plants which are so often recommended. The most favoured are perhaps the varieties of Vine, Rose, Clematis, and Wistaria.

Vines are most useful when shade is required for its own sake, and everyone knows the beauty of the autumn tints of such species as *Vitis Thunbergii, Coignetiae, Henryi,* and others. Clematis is, I think, almost my favourite plant for pergolas. The more rampant species, such as *montana, Flammula,* and *Vitalba,* are such honest hard workers and their habit is so graceful. Other beautiful sorts are insufficiently used. I give below a selection kindly furnished me by Mr. A. Jackman.

Roses for the pergola have already furnished material for many a chapter, and I need not enter upon this big subject. I give a list of Roses Mr. G. Paul is good enough to recommend.

The Wistaria at its best is unbeatable. The graceful foliage, beautiful flowers, vigorous growth, and picturesque stems, make it perhaps the most striking of all plants for a pergola.

An unusual advantage of the Wistaria is that the interior of a pergola gets the benefit of a good share of the blossom. The white-flowering varieties show up extremely well, and a combination of mauve Wistaria and Laburnum is very effective. The vigour of Wistaria is astonishing. There was, and no doubt still is, at Cold East, in Devonshire, a great plant entirely monopolizing a pergola crossing the whole width of the kitchen garden.

Fragrance must not be forgotten, nor the virtues of Honeysuckle and Jessamine in this respect.

I conclude with a reminder concerning fruit trees for pergolas, and give below a list of Apple and Pear trees recommended by Mr. Allgrove as most suitable :—

FRUIT TREES FOR PERGOLAS.

Dessert Apples.

Beauty of Bath.	Cox's Orange Pippin.
Langley Pippin.	Adams's Pearmain.
James Grieve.	Allington Pippin.
Lady Sudeley.	Wealthy.
Worcester Pearmain.	King of the Pippins.
Christmas Pearmain.	Fearn's Pippin.

Cooking Apples, possessing size, colour, and quality.

Emperor Alexander.	The Queen.
Bismarck.	Lord Derby.
Cellini Pippin.	Warner's King.
Cox's Pomona.	Newton Wonder.
Lane's Prince Albert.	Bramley's Seedling.
Peasgood's Nonesuch.	Rev. W. Wilks.

Pears.

Williams' Bon Chrétien.	Marie Louise.
Clapp's Favourite.	Pitmaston Duchess.
Marguerite Marrillat.	Thompson's.
Louise Bonne of Jersey.	Doyenné du Comice.
Conference.	Emile d'Heyst.
Triomphe de Vienne.	

ROSES FOR PERGOLAS.

Autumn-Flowering Noisettes.

Alister Stella Gray.	Mme. Cochet.
Aimée Vibert.	Rêve d'Or.

Hybrid Noisettes.

Paul's Single White.	Zéphyrin Drouin.

Climbing Hybrid Perpetuals.

Climbing Frau Karl Druschki.	Climbing Rodocanachi.

Climbing Hybrid Teas.

Climbing Richmond.	Climbing La France.
Climbing Caroline Testout.	Climbing Mrs. W. G. Grant.

Cluster Roses, Wichuraianas, &c.

Shower of Gold.	François Guillot.
Paul Transon.	Gerbe Rose.
Albéric Barbier.	Paradise.
François Juranville.	American Pillar.
Réné André.	Tea Rambler.
Léontine Gervaise.	Blush Rambler.

For Foliage, Single Flowers.

rubrifolia.	Brunonis.
Reine Olga de Wurtemburg.	himalayica.

CLEMATIS.

Spring.

Miss Bateman.	Sir Garnet Wolseley.
The Queen.	Robert Hanbury.

Summer.

Beauty of Worcester.	Lord Neville.
Fairy Queen.	Marie Boisselor.
Henryi.	Mrs. Hope.
Lady C. Neville.	Nelly Moser.

Autumn.

Comtesse de Bouchard.	Mrs. Cholmondeley.
Gipsy Queen.	Star of India.
Jackmanii.	Ville de Lyon.

Small-Flowered.

montana rubens.	Admiration.
montana superba.	Countess of Onslow.
Viticella alba luxurians.	Duchess of Albany.
V. Kermesina.	

SCHOOL GARDENING.

By Ronald C. S. Ross, F.R.H.S.

The increasing importance of the whole art of gardening, and the necessity of improved methods of cultivation throughout the country, have raised the school garden to the level of a real national asset. As such it should to a great extent serve as an experimental station for the locality, both in regard to manuring and cropping. The observation and recording of garden pests—the earliest time of appearance, season of greatest prevalence, attacks on species of plants not usually associated with a particular pest (*e.g.* the rosy rustic moth caterpillar (*Hydroecia micacea*) on the potato in 1917), conditions of weather, methods of treatment, &c.—would be invaluable in preventing widespread destruction of crops. Obviously the best time to check an outbreak is at its beginning, so that early warning would be obtained from these data.

Experimental work in methods of combating insect and fungoid pests, the cultivation of new varieties of vegetables (*e.g.* Dutch Brown Bean, Potato Majestic) for testing yield, quality, and hardiness under local conditions, should also be undertaken, and the results, when clearly established, placed before allotment and garden holders in the vicinity.

Management.—Garden classes cannot always be on the land at the hour allotted by the time-table, any more than one can perform all gardening operations by calendar, and no attempt should be made to keep blindly to either. Weather conditions alone ought to cause postponement of one week's work to another. Advantage should always be taken of soil condition for transplanting, seed sowing, and the like.

All work should be the result of reasoning. Rule-of-thumb methods do not lay the foundation of sound horticultural principles, which is the aim of school gardening. If possible, amalgamation as a junior branch with a local gardening association should be attempted. In this way the value of co-operation in the purchase of tools, manures, seeds, &c., and the disposal of surplus produce would be learnt in a practical manner.

As a grant-earning subject the special year begins on November 1, but a preliminary course might well commence in March or April; though November, or a little earlier, is the best time to break up grass land. The number of scholars taught at one time is limited by the Code to fourteen, aged eleven and upwards, and practice proves that a much greater number is not advisable. Girls need not be excluded from the classes. Younger children and infants find pleasure in bulb-

growing and flower borders, and at the same time gain some ideas of the later work.

The Garden.—The garden should, if possible, have an open, southern aspect, sheltered from north and east winds, with soil of medium consistency—neither too heavy nor too light—and fairly deep. For supervision and access it is best situated within a few minutes' walk of the school. From twenty to thirty rods would be a convenient size for a small school. It may be remembered that the common weeds in the plot give some indication of the soil and its drainage. Generally speaking, there is little choice of ground, but the foregoing points are worth bearing in mind.

If there is no protection against the cold winds, a permanent hedge can be rapidly grown if Myrobalan plum is planted.

A lock-up shed for tools—at any rate a rough shelter against the weather—should be erected.

Reasonable security of tenure is necessary.

Garden Requisites.—The tools—a little less than full-size where younger scholars are to receive instruction—should include spades, forks, hoes (draw and Dutch *), rakes, lines, a wheelbarrow, one or two gallon watering-pots, tubs for sprays and liquid manure, a sprayer and various sundries.

Planning the Garden.—As this depends upon shape, size, and position, no definite plan suitable for every garden can be given, but as a rule a one-rod plot for each child gives better results than somewhat larger plots shared by two or more children, though the latter are an improvement upon a garden worked by all the children in common. There should, however, always be one common plot, in which a large variety of vegetables would be grown; also a small experimental plot, and fruit and flower plots. Still smaller places should be marked off for a frame, rubbish and bonfire heaps, compost heaps, &c. Nursery beds can be made on sheltered spots, and room for permanent crops like rhubarb, asparagus, and certain herbs reserved.

Management.—Two lessons of one, or one hour and a half each weekly are found more useful than one longer one. They are probably best taken at the end of morning or afternoon school. Cropping should invariably be in rotation, and the rows should run as nearly as possible north and south.

It is a great advantage if a few minutes preceding the actual garden work can be devoted to a discussion of the coming operations, and the actual work done recorded immediately afterwards in special notebooks while fresh in the minds of the children. These books should contain diary, plans of the whole garden, plans of individual plots drawn to scale to show cropping, table of seeds sown, quantities of produce, income and expenditure, and notes of insects, &c., observed. Experiments, and diagrams of operations are too useful to be omitted.

Tools must be cleaned after each time of using, and arranged

* The "Caxton Cultivator," with three teeth, is an excellent tool for light and medium soils.

in good order. Work will be easier, and the life of the tools prolonged.

For the holidays a rota of boys should be chosen to keep weeds down and to stir the surface soil by hoeing. A small plot might well be left without attention as an object-lesson in the value of the constant use of the hoe.

The instructor, preferably a schoolmaster, enthusiastic and with sound knowledge of horticulture, will produce similar enthusiasm in his class. A certificate in school gardening is granted to teachers on examination by the Royal Horticultural Society, and another "Certificate of Diligent Interest in Plants" is given to the winners of school competitions.

If a section of the local Vegetable Show can be reserved for the school children it gives a wonderful impetus to the work, or a small competition among the plot-holders may be preferable in some cases. The exchange of gardening journals brought from home, the use and distribution of pamphlets issued by the Royal Horticultural Society, are invaluable means of awakening a love of garden craft and a sense of the importance of technical works. These pamphlets should play a great part in extending general garden knowledge.

Instruction will avoid the repetition of local mistakes, such as the use of potato haulm (which should always be burnt) for covering potato clamps. The burning of all diseased vegetation immediately is a habit which must never be neglected, and continually impressed upon the children. Wide-spaced planting of well-sprouted sets, rejection of doubtful seed, careful earthing up, and spraying with Burgundy or Bordeaux mixture as means of preventing disease and increasing the yield of that most important crop, the Potato, would do much to bring about better methods of cultivation in the neighbourhood.

Experimental Work.—A scheme which includes the following as a basis has given good results. Seeds: seed saving, testing, germinating, sowing. Soil: composition, tests for lime. Potatos: cut and uncut sets, sprouted and unsprouted sets, unlimited sprouts and sprouts limited to two and three shoots, spraying. A small plot left unsprayed shows the increased value of the sprayed crop. Cultivation: digging, double digging, and trenching, natural and artificial manures, &c. Fruit: pruning, grafting, &c.

Insects, Birds, Fungus, &c.—The beneficial insects and something of their life-histories, as well as of the harmful ones, should be known and easily recognized. The influence of bird life on the economy of the garden when properly understood checks the slaughter of valuable allies and the stealing of their eggs. Fungus pests should be noted. Such problems as seed dispersal and plant growth assist vegetable cultivation and the suppression of weeds. Collections of harmful insects and dried and pressed weeds are easily formed. By means of drawings in colour permanent records can be made where it is not always possible to preserve the actual specimens.

The indiscriminate and ignorant slaughter of insects and birds is to be deplored, and the wise teacher will see to it that the friends of the garden are known and protected.

Handwork &c.—Sprouting-boxes, wooden pegs and labels, fences, or more ambitious work like shed-building or frame-making are useful adjuncts. Simple repairs, too, offer a field for enterprise.

Modelling in plasticine and wax, or potter's clay which can be painted in water-colours, is a valuable means of recording the ever-changing interests of gardening, seed germination, perfect vegetable growth, the effects of insect and fungus attack, &c.

Various sections of the R.H.S. pamphlets can be simply bound to act as class text-books; and diagrams of vegetable food values as compared with meat add to the knowledge and interest of the actual garden work.

It is sometimes possible to combine bee-keeping with the work of the school garden; and, though strictly speaking outside the sphere of garden craft, poultry and rabbits can be profitably kept. Giant sunflowers would then be grown for seed.

In Conclusion.—The question as to whether girls should receive equal instruction in gardening with that given to boys lies at the discretion of the school authorities, but the labour of women on the land and the success of women gardeners, together with the lasting need of food production, make it impossible to deny its desirability.

The suggestion that whatever work is undertaken ought to bear largely upon the special conditions and requirements of local horticulture, though not to the entire exclusion of outside considerations, is obviously a correct one. The pupil must have knowledge of home requirements, but, apart from food production, the aim of school gardening, while always educational, is to provide a broad survey and practical appreciation of the work likely to be met with in any allotment or cottage garden in any part of the Empire.

SCHOOL GARDENING: A CORRELATION.

By M. A. Fayers, F.R.H.S.

Modern critics have long persistently attacked our system of elementary education by denying its practical usefulness. They say that children, especially boys in our rural districts, waste much precious time, which would be more profitably employed in the field or garden learning to follow in their fathers' footsteps as skilled farm labourers or gardeners. They say that much of the curriculum is absolutely useless; that their fathers did very well without nature study or elementary science, and that much of the matter taught is actually detrimental to their future. They complain that children remain too long at school, acquiring a dislike for an agricultural occupation, and declare that this is the chief cause of the scarcity of labour in many rural districts.

This conception of the matter is largely due to a distorted view and an imperfect knowledge of the scope and aims of the subjects so decried. The idea that the success of preceding generations in agricultural operations was not *in spite of* lack of scientific knowledge, but *because* of it, is a fallacy which must be exposed at the outset. When a man who disclaims all aid from "book-learning," as he scornfully calls it, acts upon the results of careful observation—either his own or that of others—he *is* a scientist, though he may not know it. He is employing the scientific processes of induction and deduction, though he may never have heard of them.

The modern system of education merely seeks to regulate and utilize the natural tendency to observation, which is such a precious gift in childhood. It does not ignore the probabilities of future employment, but aims at making that employment more interesting and attractive, by explaining those empirical laws which have been accepted by their forefathers as a matter of course; by experimentally proving the truth of such laws; and by encouraging individual efforts to obtain knowledge at first hand. In effect it aims at unfolding the whole field of systematized knowledge, embodied under the idea of "a science," stage by stage, from earliest years, so that the day school pupil may look forward with pleasurable anticipation to the more advanced class of the continuation school. Constant reference is made to agricultural events occurring around the school, with the special view of inviting questions on simple operations; and in this way school life is correlated with home interests.

A profitable school curriculum planned upon these lines should lead up to practical use in:—(1) the daily occupation, (2) the allotment to be cultivated in leisure hours, (3) the small holding upon which the skilled horticulturist ventures his savings.

Such a course should embrace the following features in the elementary school :—

Co-ordination of the following subjects :

(*a*) Gardening.
(*b*) Science.
(*c*) Geography (importation of plants, alluvial deposits).
(*d*) History (introduction of plants as Food and Medicine).
(*e*) Arithmetic (weighing, measuring, planning).
(*f*) Drawing.
(*g*) Composition (summary of Theory and Practice). Note making.

Gardening affords excellent opportunities for :—

1. Experimental science teaching. The proof is afforded (of proof from deduction) from experiment on a larger scale than is possible in the schoolroom. Full and independent observation is fostered.

2. Nature study in the garden embraces :—Observation of animal and plant life, natural phenomena, elementary geology, all of which are treated in a spirit of scientific inquiry.

THEORY.	PRACTICE.
Seed.	
Structure.	Preparation of ground.
Functions.	Favourable conditions of soil, temperature, environment.
Requirements for growth.	Experiments.
Soil.	
Formation.	Co-ordination in garden.
Movement.	Hoeing, manuring, and dressing.
Drainage.	Experiments.
Root.	
Structure, functions, kinds.	Illustration by means of edible garden roots.
Use of various kinds.	
Vegetative reproduction.	Layering, cuttings, experiments.
Stem.	
Growth.	Sketches.
Buds.	Explanation by experience in pruning, thinning-out, budding, and grafting.
Habits.	
Leaf.	
Parts. Functions of parts.	Illustrate in garden.
Fall. Formation of absciss layer.	Edible. Use of climbing habit.
Use as manure.	Utilization by gardeners of leaf habits.
	Experiments.
Flower and Fruit.	
Use, means of fertilization.	Observations in garden.
Attractive devices.	Flowers we eat.
Protective measures.	Experiments.
Seed-sowing.	
Reasons for method in preparation of plot, box, or pot.	Sow seeds.
	Keep records of growth.
	Experiment.
Methods of Reproduction.	
	Practise cuttings, layering, seed-gathering.
	Understand the principles of budding and bending.
To keep the garden constantly gay.	Lay out the garden.
Plans of cultivation.	Work from list, so that colour is constantly present. Alternation of flowers.
Lists of plants.	
	Constant succession of seedlings.

THEORY.	PRACTICE.
Methods of Reproduction—continued.	
Theory of operations.	Garden operations.
Danger of watering.	Planting and transplanting.
Advantages of watering.	Experiments.
Care of fruit-trees.	Winter and summer culture.
Pruning.	Experiments in right and wrong methods.
Proper methods of gathering and packing fruit.	
Principles of the preservation of fruit.	Practice in jam-making, jellies. Bottling fruit.
Knowledge of garden enemies and friends.	Discrimination between enemies and friends.
Knowledge of simple insecticides and fungicides.	*Early* use of remedies.

GENERAL METHOD.

Records of weight and measurement to be kept. Improvement in crop and type.

Effect.—Deduction of laws regulating health and growth of plant life through comparison.

If any crop in the district shows marked success or failure, the pupils should be encouraged to form and prove—as far as possible—hypotheses as to the cause of the special results noted.

Friendly rivalry between the boys and their fathers and mothers may be encouraged, by allowing pupils to take home a part of their seed. Note to be taken of the variation in results (if any), and inquiry made as to how far such has been caused by (*a*) variation in soil, (*b*) aspect of garden, (*c*) methods of cultivation.

A course of instruction in gardening for girls is advisable for the following reasons:—

1. In a small-holding much light gardening work can be done by women, so as to free the men for more strenuous labour and thus lighten the working expenses.

2. Experience has proved that few emigrants have time to devote to the raising of vegetables. When the wife or sister understands the principles of horticulture, common vegetables can be raised on a colonial homestead without encroaching on the time of the stock-man or wheat-farmer.

3. Gardening in its lighter forms can be profitably pursued by girls, and a substantial increase made to income by growing salad plants, flowers for market.

4. Where a small plot is available for bush-fruit, instruction can be given in packing fruit for transit; and the principles of jam-making, and the preservation of fruit by bottling, could be taught.

CORRELATION OF SUBJECTS.

Arithmetic.—Problems dealing with proportion of sugar to fruit, average time, cost, &c.

Market price of flowers, vegetables.

Return minus commission.

Proportion of capacity to weight in various fruit crops. (Packing.)

Composition.—Dealing with processes taught; original observation and experience.

Science.—Suitable soils, action of water, aspect for special classes of flowers, soil texture, light, air, warmth.

Continuation School.

Abnormalities of plant life met with in the garden form interesting subjects for discussion at Gardeners' Meetings or Evening Classes. The great aim of any class in this subject should be to make the acquisition of knowledge dependent on the students' own observations, to make original sketches illustrating the experiments which they themselves set up and to write original notes, explaining the objects of the experiments, describing the results and drawing inferences from them. Chemical analysis could be made of the tissues of plants, with a view to the discovery of their constituents, in order that plant foods suitable for their individual needs may be supplied. Graphs showing in a picturesque form the proportion of the principal food stuffs found in typical plants might be drawn up so that the student might, at a glance, estimate the relative value of the various species of plants under cultivation; a very important matter when the cropping of a limited area is under consideration.

The study of such subjects might be made more interesting by frequent use of lantern illustrations, which might very well reproduce many of the students' own observations. The special advantages to gardeners of such a course of study are obvious. All practical work, if it is to be really successful, *demands* scientific knowledge, and accurate information based on correct principles. This knowledge is best gained by experimental observation, under expert guidance. The gardener who is equipped with this scientific knowledge is more likely to achieve success than one who relies upon tradition and "rule-of-thumb" methods. He understands the best conditions for securing good crops, and, more important still, by realizing the importance of those conditions and the forces which produce them, he is often able to modify the environment of the plants under his care, so as to produce the very conditions conducive to their welfare. It is too costly and tedious a business to experiment in the garden—this must be done in Night School or Laboratory.

The value of poultry and pigs as an adjunct to the garden should be taught, practically if possible—if not, theoretically.

1. Droppings = concentrated manure of great value.

2. Use for garden refuse.

3. Fowls kept on a neglected piece of garden for a short time speedily clear it of weeds, and by their droppings convert it into a valuable plot suitable for immediate cultivation. This matter can be correlated also with ordinary school work by:—

1. Oral lessons followed by practical observation.

2. Experience at home or in experimental fowl-run attached to the school.

The value of bees as pollinating agents in a garden should be noted. Where possible, beehives should be kept in the school garden, and practical instruction given on their management.

A course such as this should be of material help to the small-holder, who has, as a rule, a limited income to work with, and needs therefore to employ those methods which will give the maximum of success and the minimum possibility of failure. He cannot afford to experiment on his holding; if he is wise, he will gladly welcome any opportunity of doing so without expense to himself. Such an opportunity is given in a course of experimental science dealing with plant life in all its phases, given by an expert upon the subject.

PLANT DISEASE AND THE "VICIOUS CIRCLE."

By Jamieson B. Hurry, M.A., M.D.,

Author of "Vicious Circles in Disease."

A Vicious Circle in pathology is defined in Murray's English Dictionary as "a morbid process consisting in the reciprocal continuation and aggravation of one disorder by another." This process plays a rôle of great importance both in animal and in vegetable pathology, especially in the higher members of the two great kingdoms of living things in which there is differentiation of structure and function.

Throughout life there is a constant process of reciprocation taking place between various organs and functions. Thus in animals the nervous, the cardio-vascular, the respiratory, the digestive, the renal and other systems are intimately associated with each other, their functional activities being harmonized by an all-controlling nervous system, increased or diminished requirements in one direction being balanced by the necessary adjustments in another. Moreover, a swiftly circulating fluid by means of a self-regulating mechanism supplies to each tissue the quality and quantity of nutriment required, while waste products that would clog further activity are removed.

The corresponding correlations as seen in plants are less obvious than they are in animals. There is neither an all-controlling central nervous system, nor a rapidly circulating nutrient fluid at all comparable with the blood. Nevertheless, in principle the phenomena of correlation are the same as those in animals, and are governed by protoplasmic stimuli connecting every part of the organism with every other part.

This applies to the shoots, leaves, cortex, cambium, roots—in fact to every organized structure, although the inter-dependencies are more intimate in some cases than in others. Thus both in animals and in plants the vital mechanism is carried on by means of a ceaselessly operating chain of complex and reciprocal interactions.

Even within the limits of health there is frequent disturbance of the harmonious co-operation between various organs. Such disturbance, however, rapidly provokes reactions which remove the source of irritation and restore the natural state of equilibrium. If the disorder is too severe to be repaired by physiological reactions the condition passes into one of disease.

Disorder in one organ is then apt to awaken disorder in other organs, which in turn reacts injuriously on the first, so that a sequence of pathological correlations is established. Thus in the case of the animal cardiac disease affects the nervous, the respiratory, the digestive

and other systems sympathetically, and these secondary disorders in their turn injure the organ primarily affected. Thus is the *circulus vitiosus* established. Doubtless to some extent one organ can give vicarious assistance to another in difficulty. But this power of relief is limited since there is no great provision of reserve.

In the diseased plant similar injurious interdependences are observed.

A common illustration is afforded by root starvation leading to an inadequate supply of nutritive material to the assimilating leaves. Their metabolic activity is impaired, and such impairment reacts injuriously on all other organs. Growth and development are checked and there is less material to transport. Further root starvation takes place, and the sequence of events is repeated and intensified.

A similar concatenation of injurious factors may start from any other tissues. If the leaves of a plant are so feebly illuminated that assimilation is reduced to a minimum, far-reaching results obtain. The stem remains thin; the development of the cambium layer is checked; the supplies of nutriment passing to the roots are insufficient for their growth and for the formation of new root-hairs. Absorption of water and salts is interfered with, and this in turn further curtails the functional activity of the leaves. Here also is established a mutual causal relation between disease of various organs.

There is, however, a striking difference in the manifestation of the morbid process in animals and in plants.

In animals, owing to the higher differentiation of organs, numerous specific *circuli vitiosi* are met with, and fresh examples are frequently discovered. Thus disease of the blood provokes disease in other tissues, which in their turn pour products of perverted activity into the blood, and it is possible to study this endless chain of disorders link by link.

Future research may yield similar processes in plant pathology. But at present specific effects of morbid reactions are almost a *terra incognita* owing to lack of detailed knowledge of functional disorders in plants apart from those caused by attacks of parasites. On the other hand, the general principle is in universal operation, manifesting itself not by specific results but by the production of a lowered resistance to morbific agencies, and playing a part of great importance in the growth and life-history of the plant.

It may be of interest to summarize briefly some causes of lowered resistance, and then to discuss its effects. Immaturity of tissue is a common cause of impaired resistance. The epidermis in early life is both tender and thin, and may be penetrated by bacteria or fungi that are powerless to injure plants whose epidermis has become cuticularized or replaced by cork. On the other hand, advanced years also predispose to infection. In young coniferous trees well provided with resin canals injuries in the cortex are at once sealed by an exudation of turpentine and thus protected from wound fungi, while in older trees turpentine and resin are less freely exuded as

styptics. Again, wounds are more slowly occluded by callus in old age than in youth. Such predisposing factors enable many organisms successfully to effect an entrance and to weaken the host further. According to recent researches by APPEL, excess of air in the tissues associated with insufficiency of water is another common cause of lowered resistance.

Parasitic invaders may abstract their food from the host-plant by various methods. Some ramify in the intercellular spaces and middle lamellae; others send haustoria into the actual cells. Many secrete enzymes or toxins which destroy cells or cell-walls, the materials of which then promote further growth and proliferation of the parasites. Hence fresh enzymes or toxins are secreted for the destruction of remoter cells, which in their turn fall a prey to the ever-spreading invader. Thus the morbid process *vires acquirit eundo.*

The effects of circular reactions may be briefly discussed under three headings: (I.) The Perpetuation of Disease; (II.) The Destruction of Organs; (III.) The Termination of Life. These groups, however, are by no means sharply defined; diseases placed in I. and II. may under exceptional conditions prove fatal, while diseases placed in III. may be so chronic as scarcely to shorten the duration of life.

I.—The Perpetuation of Disease.

The perpetuation of a disease through insufficient chlorophyll assimilation has already been referred to. In other cases the morbid process may be initiated by living organisms.

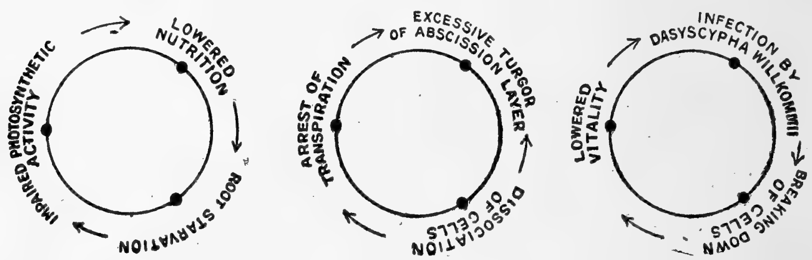
Both the true fungi as well as Schizomycetes (Bacteria) and Myxomycetes (Slime Fungi) may be concerned.

Peridermium Pini.—A striking example may be found in the case of pine-blister caused by *Coleosporium senecionis* (*Peridermium Pini* var. *corticola*), a fungus which attacks the cortex of the Scotch and Weymouth pines amongst others. The hyphae grow in between the green cells of the cortex as well as in the bast-tissues, and may even penetrate the medullary rays and resin-canals. Other hyphae pierce the cells, consume the starch and other food stuffs, and cause a serious loss of resin which both soaks into the wood and exudes from the bark. This loss of resin involves a serious impairment of vitality. Moreover, the effusion of turpentine into the wood interferes with conduction in these tissues and lowers the nutrition of the tree, especially above the point of attack, since the flow of sap is checked.

Meanwhile the parasite nourishes itself on the juices which it has liberated and on the contents of the cells it has invaded. Thus a struggle takes place which may last for many years. If the tree is vigorous it may, by the diversion of metabolic material, form sufficient cork to shut in and suffocate its enemy. But as a rule the invader extends its ravages and converts a robust thriving tree into a dwarfed sickly one. The more the parasite can arrest the flow of sap and the greater the loss of resin the more is vitality impaired, and the less the vitality the more rapid the progress of the invader. Cause and

effect aid and abet each other, and the result is a chronic invalidism of an enormous number of trees that are attacked by this disastrous disease.

A similar process is frequently observed as a result of bacterial invasion. Erwin F. Smith has described a number of leaf-spot diseases in which the parasite penetrates through stomata in the unbroken leaf and stem surface, and multiplies in the substomatic chamber, causing a local destruction of tissue. Thus *Bacterium Phaseoli* is responsible for the spot disease of beans, *Bacterium maculicolum* for the spot disease of cauliflowers, and other examples have been observed. Leaf spots are often slow in their progress and confined to small areas, the reason probably being that the vascular system is not invaded. Nevertheless, the bacteria weaken the cells of their host or destroy them altogether. With increasing supplies of food and a nidus rendered alkaline by their own excretions, the bacteria multiply more and more, unless indeed, as sometimes happens,



The Perpetuation of Disease. The Destruction of Organs. The Termination of Life.

FIG. 49.—PLANT DISEASE AND THE "VICIOUS CIRCLE."

the host can arrest the morbid gyration by separating the diseased from the healthy tissues by the formation of a corky layer.

II.—THE DESTRUCTION OF ORGANS.

Another result of an injurious circular reaction is the destruction of an organ either by a non-living or a living agency.

The action of a non-living agency is illustrated by the premature shedding of leaves or of twigs which may be thrown off in great numbers as a result of organic tissue changes.

The disorder is most often observed as regards leaves, and is initiated by an impairment of assimilation and transpiration processes, as a result of which the suction force by which under healthy conditions the sap is drawn up is lost. Consequently the sap accumulates in the basal leaf zone through which the line of cleavage ultimately passes, and which becomes excessively turgid with osmotic materials. This turgor stimulates to premature activity the dormant cells of the abscission layer; the partition wall between adjacent cells swells and a process of dissociation is inaugurated. The result is a further impairment of vitality in the leaves, culminating in complete detachment. To quote SORAUER: "Every premature shedding of leaves

is due to a disturbed equilibrium in the distribution of turgor." In other words, the process of premature cleavage is due to an arrest of metabolic activity causing pathological turgor at the basal zone followed by a progressive loss of activity.

A similar process accounts for the premature shedding of twigs or shoots which may occur as early as July. The oak and the poplar are frequently affected, the ground being in some cases thickly strewn by the detached twigs.

The destruction of organs may also be due to the attacks of parasites, some of which display a preference for certain organs, such as leaves, twigs, tubers or buds. A lowered state of vitality predisposes to such parasitic invasion, which then further lowers nutrition, culminating in the total destruction of the organs.

1. *Lophodermium Pinastri.*—As an example of a parasitic leaf-shedding disease may be mentioned the Pine Needle-cast caused by the fungus *Lophodermium Pinastri,* also called the Pine Leaf-scurf or leaf-shedding fungus.

The disease chiefly attacks the young and tender leaves of the Scots and Austrian Pines and other Conifers, and may cause many of their leaves suddenly to wilt and drop. The needles when first attacked are merely speckled with brown spots containing the mycelium of the fungus. But in the following year they wither, turn red or brown and die off in hundreds. This loss of leaves seriously weakens the plants and thus hastens the progress of the disease. The greater the loss of foliage the less the power of resisting infection. It is for this reason that the parasite is most destructive in shut-in valleys or low-lying situations, where the trees possess least vitality and consequently succumb most readily.

2. *Ustilago.*—The destruction of plant organs as a result of the *circulus vitiosus* is also illustrated by the action of the cereal smuts (*Ustilago*), which attack such grains as are rendered liable to infection by lowered vitality. The smuts reduce the ovules to a black powdery mass of spores, which are carried away on the wind or otherwise dispersed, leaving nothing but the bare axis on which the flowers were originally situated.

III.—The Termination of Life.

Many examples might be given of the death of a plant as a result of the morbid process under discussion. One fatal disease due to a fungus and one due to a bacillus may be referred to.

Dasyscypha Willkommii.—The well-known larch canker, associated with the *Dasyscypha Willkommii,* is an example of a fungus disease which is responsible for the loss of an enormous number of trees in our woodlands. The larch is indigenous in the Alps, where there is a long winter season, followed by a short or no spring, and by a short hot summer. Owing to the rapid transition from winter to summer the larch buds open very rapidly when once they start. Hence the period during which the foliage is young and tender and susceptible

to attack is very short, since the tree passes rapidly into its summer state with its increased power of resistance. When, however, the larch is planted in such a country as England, with a mild winter and a long and damp spring, the period of foliation extends over six or eight weeks, instead of two as in the Alps, so that insects and fungoid enemies have a much longer period during which to do damage.

One of the great enemies of the larch is the fungus *Dasyscypha Willkommii*, which effects a lodgment in wounds in the young leaves and shoots made by plant-lice (*Chermes laricis*) or the mining-moth (*Coleophora laricella*), or by some other injury which breaks the surface continuity. In such a wound the spores find a favourable nidus, whence the mycelium penetrates into the cortex during the quiescent period of winter.

If the tree has sufficient vitality it may succeed during the period of active growth in cicatrizing the canker-spot by surrounding the blister by a tough corky layer and thus arresting its progress.

But under less fortunate conditions, when autumn returns, the mycelium penetrates further into the cambium and enlarges the canker-spot. Eventually it reaches the wood and interferes with the flow of sap. The further the invader advances the more is the resisting power of the host plant weakened, while such loss of resistance quickens the progress of the fungus. In course of time the tree sickens and dies.

Bacterium Hyacinthi.—The yellow bacteriosis of hyacinth bulbs may serve as an example of a specific and fatal bacterial disease, being due to *Bacterium Hyacinthi*. Healthy bulbs are rarely attacked; but if a wound or other condition has impaired vitality infection readily follows. The sequence may thus be represented:

Growth of Bacteria ⟶ Breaking up of living cells

↖ Supply of Nutriment ↙
to Bacteria

In the early stage of bulb infection the disease is confined to the vascular bundles, from one to fifty of these being yellow and full of bacterial slime. But at a later state the disease spreads to the intervening parenchyma, and finally the whole bulb is destroyed.

These examples of injurious circular reactions in phytopathology might be indefinitely multiplied. But they suffice to indicate the operation of a wide-spread principle. The process belongs to those fundamental biological phenomena which are common to both the higher animals and plants. Within the limits of health organization is of unquestioned advantage. But the liability to pernicious and reciprocal correlations is a serious penalty paid for such organization when physiological processes are disturbed by disease.

The simpler organization of plants probably explains why this complication of disease is so much less specific than it is in zoopathology. Another reason is that in animals every organ is fully developed and performs its functions almost to the utmost, while in the plant, on the other hand, there are always present the rudiments of new organs as well as reservoirs of reserve materials, and each of these provisions can assist in making good any failure of functional activity. A further explanation may be found in the more intimate union of cells in the animals as compared with the plant allowing of closer interdependences.

Apart from these reasons, however, there can be little doubt that with the growth of our knowledge of correlations in plants many examples of specific *circuli vitiosi* remain to be discovered. A further proof will thus be supplied of the essential unity in the laws governing animal and vegetable pathology.

Lastly, the study of Vicious Circles contributes to scientific horticulture. It should indeed be a cardinal principle of the treatment of plant diseases to interrupt injurious circular reactions at the earliest possible moment. The smallest help afforded at the right moment may arrest the progress of disease and break the sequence of the destructive factors. If a beginning is once made, the *vis medicatrix naturae* may once again become operative and complete the processes of repair. In the words of a famous therapeutist, Sir LAUDER BRUNTON: "We must see where the Circle can best be broken, since if we break it at one point we allow recovery to commence."

REPORT ON METEOROLOGICAL OBSERVATIONS AT WISLEY, 1917.

By R. H. CURTIS, F.R.H.S.

THE present is the Fourteenth Annual Report on the Meteorological observations made at the Society's Climatological Observatory in the Gardens at Wisley, the daily readings of the instruments having been continued without a break since the beginning of 1904. To the horticulturist the outstanding feature of the weather of 1917 was the unusual intensity and persistence of the cold which prevailed throughout the first four months of the year, and also during the closing four weeks. During the whole of these five months the temperature was much below the normal (see fig. 50); and although, later on, this was to some extent balanced by the warmth of summer, yet it sufficed to bring down the average temperature for the year to considerably below the normal point. Taking the seventeen weeks comprised in the first period, January to April, there was but one week which could be regarded as seasonably warm, whilst eleven were phenomenally cold, and the other five also cold, but to a lesser degree. As regards rain also—another all-important climatological factor to the gardener—whilst in most districts the total fall for the year did not differ greatly from the usual amount, its distribution over the twelve months was unusual. The early, cold, months were also very dry ones; but July and August were remarkably wet; and in June there occurred in London, and also in Somerset, local downpours of rain of extraordinary—and indeed, so far as the records go, of unprecedented—violence. During the winter months snow fell rather frequently, and occasionally the falls were large, although as a rule they were noticeable rather for their frequency than for their intensity. At Wisley more or less rain fell on one hundred and thirty-seven days, and snow on twenty-two days. A somewhat smaller amount than usual of bright sunshine was registered generally, and at Wisley the recorded total duration amounted to only one-third of the time the sun was above the horizon, so that the year cannot be regarded as a bright one.

The chief climatological features of the year of immediate interest to the horticulturist can be at once appreciated by reference to the four diagrams which accompany this Report. In fig. 50 is shown, for each month of the year, the amount by which temperature and rainfall exceeded or fell short of the average. Fig. 51 indicates for each month the mean temperature of the air, and of the soil at depths of one foot and four feet, and therefore exhibits for each location the " March " of temperature throughout they ear. Fig. 52 shows at a glance the relative frequency of winds from different points of the compass, and also the relative prevalence of calms. Fig. 53 brings

into view the relation between the mean temperature of the air and its average daily variation (the mean maximum and mean minimum);

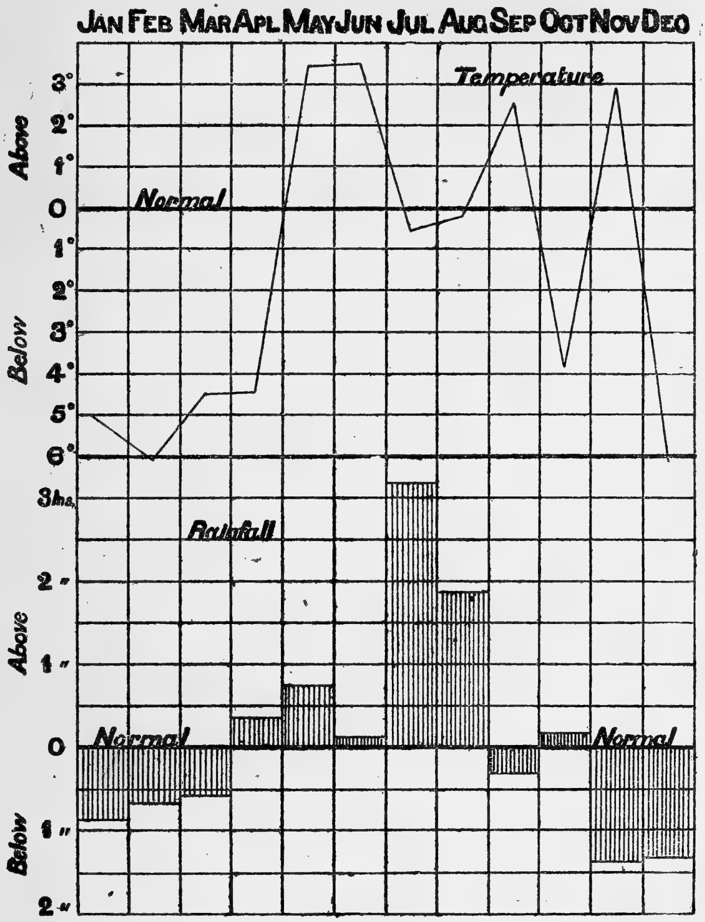


FIG. 50.—TEMPERATURE AND RAINFALL AT WISLEY, 1917, AS COMPARED WITH THE AVERAGE.

and also the mean temperature of the ground surface where it is covered with short grass.

The weather conditions for each month of the year may be summarized as follows:—

January.—The spell of cold weather, which had been so marked a feature of the closing months of 1916, was abruptly broken near the close of December, and the New Year began with a brief interlude of unusual mildness. This came about under the influence of a south-westerly wind which blew for a few days, and brought with it maximum temperatures of between 50° and 60° in several parts of the kingdom, the highest recorded at Wisley being 53°. But the improvement was very short-lived, and by the close of the first ten days Arctic conditions had again become general all over the British Isles. In

parts of Ireland, as well as over England and Scotland, the screened thermometer, four feet above the ground, showed from eight to ten degrees of frost; whilst unscreened thermometers laid in the open, close to the grass and fully exposed to the sky, gave much lower readings still: as, for example, at Wisley, where it recorded 25° of frost! It is obvious that the indications of this last-mentioned instrument are of special interest to gardeners, since it shows the degree of cold to which out-door vegetation has actually been exposed.

In the course of the month there were a few bright (but not *warm*) days, and, generally speaking, the amount of sunshine was largely

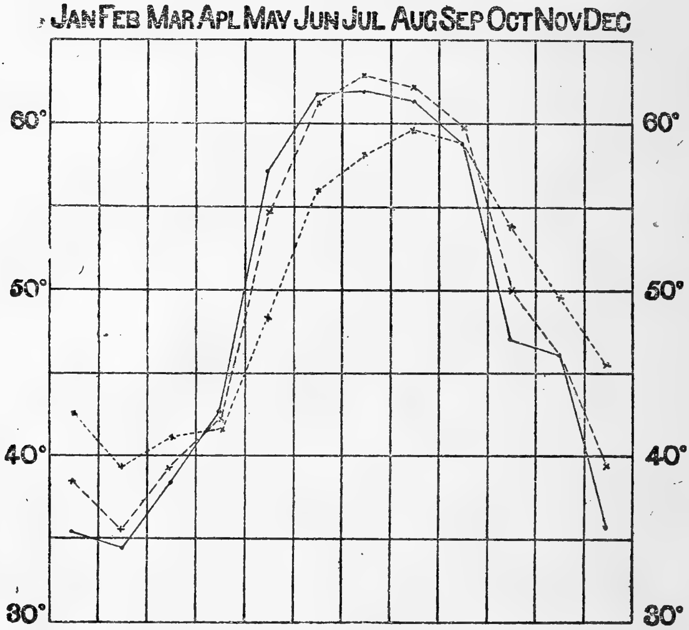


FIG. 51.—MEAN TEMPERATURE OF AIR (—), EARTH AT DEPTH OF 1 FOOT (- - -), AND EARTH AT DEPTH OF 4 FEET (....), FOR EACH MONTH OF 1917 AT WISLEY.

below the average; but notwithstanding this, and the generallv unsettled character of the weather, there was less than the usual amount of rain or snow over the greater part of the kingdom. With such conditions as these, following as they did upon a long-continued spell of cold at the close of the preceding year, it was only what might have been expected, that vegetation generally should have been unusually late, and gardening operations everywhere, more or less, held up.

But in addition to this delay much real damage was done even to very hardy plants by the extreme cold, and perhaps still more by the biting, dry, easterly winds which accompanied it, and in a few districts also by the somewhat rare phenomenon known as *glazed frost*, when moisture falling as fine rain (sometimes almost imper-

ceptibly) upon the frozen ground becomes at once congealed, and covers everything with a coating of clear ice.

The results of the observations made daily at the Climatological Observatory in the Society's Gardens at Wisley are shown in the following table:

Mean temperature of the air in shade	35·1°		
Highest ,, ,, ,,	53°	on the	1st
Lowest ,, ,, ,,	20°	,,	30th
Lowest ,, on the grass	7°	,,	30th
Number of nights of ground frost			26

	At depth of		
	1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	38·4°	40·4°	42·7°
Highest ,, ,, ,,	45°	44°	44·5°
Lowest ,, ,, ,,	33°	37°	40°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 91 per cent.

Rain or snow fell on 13 days, to the total depth of 1·05 inches (equivalent to about 5 gallons of water to the square yard). Heaviest fall on any day 0·28 in., on the 5th.

The prevailing winds were at first westerly; then from north-east and east.

The average velocity of the wind was 8 miles an hour.

There were 38 hours of bright sunshine, equal to 15 per cent. of the greatest possible amount.

There were 16 days on which no sunshine was recorded.

February.—The weather generally experienced over the United Kingdom during the greater part of this month was just a continuation of the Arctic conditions of January, but they were of even greater intensity and spread themselves over a rather larger area. Again it was dry, but at the same time very dull over the greater part of the kingdom, and during the first few days the cold was more intense than at any time in January, or indeed for many past winters. At Wisley the average temperature in the screen (four feet above the ground) was 34° Fahr., instead of 40°, which is the usual average for the month; but on the ground the fully exposed thermometer once fell to 4° *below* zero (36° below the freezing-point), and on the warmest night of the month the temperature was no higher than 37° Fahr., conditions which are without parallel in the records hitherto obtained at the Gardens. The wind, too, was as keen and biting as in January, and was responsible for much damage to vegetation; at Wisley "all vegetables suffered very much, many appearing as though they had been seared by fire; whilst trees and shrubs were likewise much injured by the bitter winds"; and a similar experience was fairly general over a large portion of the kingdom: *e.g.* in the West of Ireland, "hundreds of birds were killed by the intense cold and want of food;" in the English Midlands, "evergreens, such as yew, laurel, holly, and ivy, were *scorched* by the frost"; and in Devon, on the southern edge of the Dartmoor region, "the frost lasted continuously for 91 days, . . . and nearly all the furze was killed." To find a parallel for duration and intensity one must go back at least to 1895, but the Dartmoor record claims to have been the longest continuous frost for sixty-two years. At Wisley, up to the middle

of this month, there had been forty-two consecutive days of ground frost; and during the latter half the ground temperature varied from between 12° below freezing to a maximum of 7° above. It was again a dull month generally with less than the average amount of sunshine everywhere, with the exception of the north of Scotland and the south-west of England: in these two districts, at

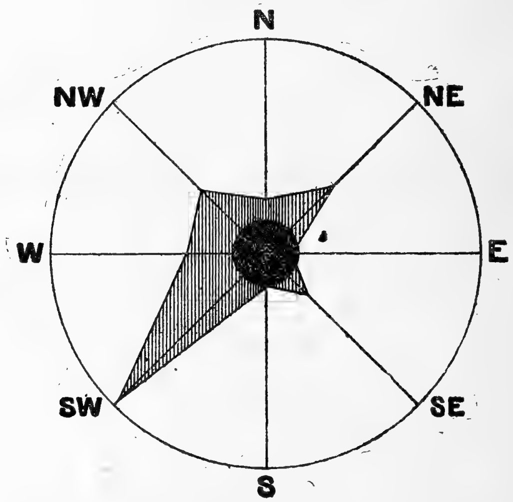


FIG. 52.—RELATIVE FREQUENCY OF WINDS FROM DIFFERENT POINTS OF THE COMPASS AT WISLEY 1917.
The black circle represents calms.

the opposite extremes of the kingdom, the amount registered rather exceeded the average.

The Wisley results are as follows:

Mean temperature of the air in shade	34·2°		
Highest ,, ,, ,,	50°	on the	27th
Lowest ,, ,, ,,	5°	,,	7th
Lowest ,, on the grass	—4°	,,	7th
Number of nights of ground frost			21

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	35·3°	36·7°	39·2°
Highest ,, ,, ,,	41°	40°	41°
Lowest ,, ,, ,,	32°	35°	38°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain or snow fell on 10 days, to the total depth of 0·76 inches (equivalent to about 3½ gallons of water to the square yard). Heaviest fall on any day 0·28 in., on the 4th.

The prevailing winds were easterly, but light and variable.

The average velocity of the wind was only a quarter of a mile an hour.

There were 40 hours of bright sunshine, equal to 14 per cent. of the greatest possible amount.

There were 10 days on which no sunshine was recorded.

March.—An unusual degree of cold was again the outstanding feature of the weather of this month, as it had been of its three immediate predecessors, the mean temperature being generally about

four degrees below the average for March. But in addition to being cold the weather throughout was also everywhere dull and unsettled; and although in most districts the actual amounts of snow and rain recorded were somewhat below the average, yet the dampness of the air, combined with the extreme cold, made the weather exceedingly "raw" and unpleasant. Over the northern half of the kingdom, and also in the higher and more exposed portions of the English Midlands, the temperature fell occasionally to points in the near neighbourhood of zero, and here and there temperatures *below* zero were recorded. Of course, with such weather conditions all garden and agricultural work was still further hindered, and by common

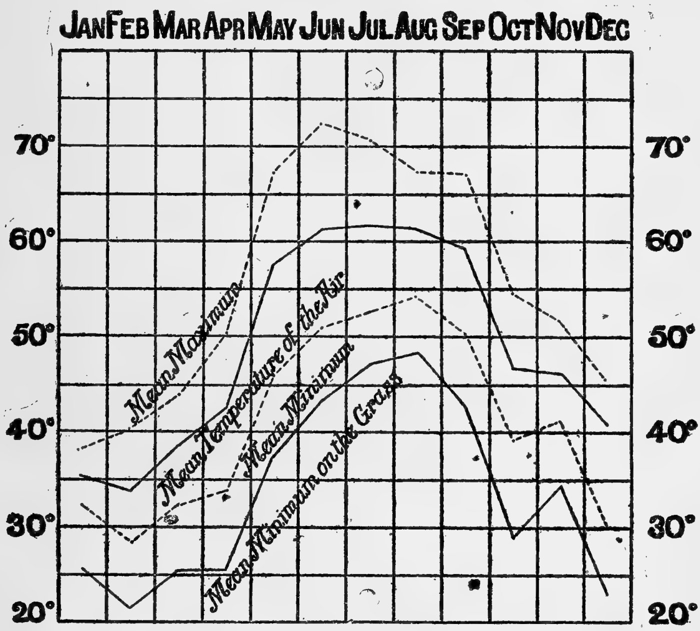


Fig. 53.—Mean Temperature, Mean Maximum and Mean Minimum Temperatures of Air and Mean Minimum Temperatures on Grass for each Month of 1917 at Wisley.

consent the season was reported as having been, all over the kingdom, the most backward experienced for a long series of years. At Wisley scarcely any Spring flowers were to be seen, a few Crocuses being the only things of the kind in bloom, and all gardening operations were much hindered. Ground frosts were registered in the Gardens on twenty-seven out of the thirty-one nights of the month, and on only two occasions did the thermometer rise, at any part of the day or night, so high as 50°. Bright sunshine was deficient everywhere, with the exception of one or two favoured districts, and in many districts the deficiency was large. It only remains to add that the month maintained its reputation for windiness, a feature which, combined with those already mentioned, helped to make it (in the

words of a gardener well known in an English Midland county) "the most abnormal and backward March of any experienced for upwards of thirty years."

The mean results for Wisley are given in the following table:

Mean temperature of the air in shade	38·2°		
Highest ,, ,, ,,	57°	on the	17th
Lowest ,, ,, ,,	20°	,,	9th
Lowest ,, on the grass	9°	,,	9th
Number of nights of ground frost			27

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	39·2°	40·2°	41°
Highest ,, ,, ,,	42°	42°	42°
Lowest ,, ,, ,,	35°	38°	40°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 88 per cent.

Rain fell on 18 days, to the total depth of 1·65 in. (equivalent to about 8 gallons of water to the square yard). Heaviest fall on any day 0·31 in., on the 6th.

The prevailing winds were from between south-east and north, but at the close of the month they were westerly.

The average velocity of the wind was 7 miles an hour.

There were 69 hours of bright sunshine, equal to 19 per cent. of the greatest possible amount.

There were 7 days on which no sunshine was recorded.

April.—The abnormally wintry character of the weather, which had prevailed with scarcely any interruption since the closing days of November, did not undergo any real change of type until April was nearly ended, so that it may fairly be said that winter had lasted for five consecutive months—a period of quite exceptional length. Throughout this long interval a large body of air (technically known as an "anticyclonic centre," or "area of high-pressure") had persistently maintained itself over the Atlantic, to the west and south-west of the British Isles, whilst "depression centres," with their attendant sequence of winds drawn from the cold regions of the North Atlantic and Arctic oceans, had followed each other in quick succession along an easterly track, skirting the area of high pressure, and passing more or less over the British Isles, bringing with them the Arctic weather we had to endure. But quite at the close of April the long sequence came to an end with the shifting of the anticyclonic centre eastwards, actually over the British Isles; and with this movement there came a welcome rise in temperature everywhere, the thermometer at Wisley showing on the morning of the closing day of the month a reading 20° above most of those that had been recorded there during the first fortnight. The *mean* temperature for the month was, however, very low, and this continued cold, following upon the unusually severe and persistent cold of the earlier months, seriously retarded all garden work and growth. At Wisley it was estimated that all growth was five weeks later than usual, and Narcissi and other bulbs which usually flower in March did not begin to do so until the close of April, whilst even then no fruit-tree buds had opened. But from all parts of the country there came similar reports, *e.g.* from Middlesex, "latest spring for at least 25 years";

Isle of Wight, "lowest mean temperature during my 35 years' records"; Scotland, "coldest April during last 60 years," etc. But not only gardeners—farmers and flock-masters were also severe sufferers from the continued frost, and from heavy snow-drifts; and in more than one district, one of them being in the west of Ireland, these snow-drifts caused loss of human life also. The rainfall of the month was as a rule rather less than the average, but over the northern districts the average was somewhat exceeded.

The following table summarizes the results of the observations made at Wisley:

Mean temperature of the air in shade	42·4°		
Highest ,, ,, ,,	63°	on the 30th	
Lowest ,, ,, ,,	27°	,, 7th	
Lowest ,, on the grass	13°	,, 2nd	
Number of nights of ground frost			27

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	42°	42·2°	41·9°
Highest ,, ,, ,,	49°	47°	44°
Lowest ,, ,, ,,	38°	39°	41°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 78 per cent.

Rain fell on 15 days, to the total depth of 2·02 in. (equivalent to about 9·4 gallons of water to the square yard). Heaviest fall on any day 0·32 in., on the 2nd.

The prevailing winds were from between north-west and north-east.

The average velocity of the wind was 6 miles an hour.

There were 156 hours of bright sunshine, equal to 38 per cent. of the greatest possible amount.

There was but one day on which no sunshine was recorded.

May.—In marked contrast to what had occurred during the preceding months of the year the weather of May was unusually fine and warm; everywhere the temperature was higher than the average, the excess varying from about one degree at places on the coast to as much as six degrees over some inland districts, where the heating power of the sun made itself more manifest. As might have been expected from these conditions, a good many thunderstorms occurred in various parts of the kingdom, some of them being of unusual severity, accompanied by floods of rain, or by heavy falls of hail; but whilst in the western and southern districts the total rainfall was above the average, it was generally below it elsewhere. The amount of bright sunshine recorded was as a rule less than the average, the Eastern Counties of England being the most favoured, with about one-half of the possible amount; whilst Scotland had less than one-third, and the remainder, speaking generally, between one-third and one-half of the total possible amount; at Wisley the average daily duration was six and three-quarter hours. But taking a broad view of the climatological conditions, they were very favourable for gardening or farming operations; and although at the opening of the month everything was very backward, owing to the protracted winter, now, with the hot days, all growth leapt forward, so that by the close of the month the leeway had been more than made good, and the outlook

had become excellent. At Wisley it was reported that the "prospects for fruit were magnificent, notwithstanding that much of it had fallen with the hot weather"; and that "the caterpillar pest was bad both on fruit and forest trees. All vegetable, corn, and hay crops were splendid." Other reports spoke of "wonderful growing weather" in Yorkshire and elsewhere, whilst generally, all over the kingdom, the close of the month found "the face of the country presenting its normal aspect."

The following are the mean results obtained from the observations made at Wisley:

Mean temperature of the air in shade	57·2°	
Highest ,, ,, ,, ...	79°	on the 13th
Lowest ,, ,, ,, ...	35°	,, 2nd
Lowest ,, on the grass	22°	,, 9th
Number of nights of ground frost		9

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M. . . .	53·9°	52·1°	48·6°
Highest ,, ,, ,, . . .	60°	58°	53°
Lowest ,, ,, ,, . . .	48°	47°	45°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 73 per cent.

Rain fell on 9 days, to the total depth of 2·20 in. (equivalent to about 10 gallons of water to the square yard). Heaviest fall on any day 0·73 in., on the 29th.

The prevailing winds were from between south-east and north-east.

The average velocity of the wind was 5 miles an hour.

There were 208 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There were but 2 days on which no sunshine was recorded.

June.—The weather during June exhibited some curious and apparently contradictory features. It was a bright and sunshiny month, and on the whole warmer than June generally is, but the distribution of warmth throughout the month was quite unusual. During the first fortnight the daily maxima gradually increased until the days became excessively hot, and in many places the thermometer rose to nearly 90°, and in some parts of south-east England higher still. At Wisley the highest maximum reached was 89° on the 17th, but only a week later a ground frost occurred in the night, and did damage to potatos and other tender things in some sheltered parts of the grounds, and the weather becoming still cooler as the month drew to a close, there was presently brought about a cold spell, in which the temperature fell considerably below its normal for the time of year—indeed, in the east of Scotland the minimum on the last day of the month was so low as 32°, whilst the mean temperature for the week was more than 6° below the normal. The rainfall was generally less than the average, but in some places it greatly exceeded it, owing to the occurrence of excessively heavy local rain-storms about the middle, and again near the close, of the month. In the first of these there was an unprecedented fall over western London, when amounts varying between two and a quarter and four and three-quarter inches were measured, the centre of the storm, and the

locale of heaviest fall of rain, passing over Holland House, Kensington. The second storm occurred on the night of the 28th in Somerset, when there fell at Bruton 9·84 in. of rain, the largest daily fall hitherto recorded in Great Britain. It is perhaps unnecessary to point out that such storms as these quite upset the normal averages for the districts in which they occur. The weather conditions of the month, although at no time really settled, were on the whole favourable for the development of plant growth, and at Wisley everything made extraordinary progress, although, owing to the forcing character of the weather, the flowers were over very quickly.

The mean climatological results obtained at Wisley are given in the appended table:

Mean temperature of the air in shade	61·6°	
Highest ,, ,, ,, ...	89°	on the 17th
Lowest ,, ,, ,, ...	42°	,, 23rd
Lowest ,, on the grass	32°	,, 23rd
Number of nights of ground frost		1

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	61·3°	59·5°	55·7°
Highest ,, ,, ,, ...	65°	62°	57°
Lowest ,, ,, ,, ...	59°	57°	53°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 70 per cent.

Rain fell on 10 days, to the total depth of 2·28 in. (equivalent to about $10\frac{3}{4}$ gallons of water to the square yard). Heaviest fall on any day 1·51 in., on the 28th.

The prevailing winds were from between south-west and north-west.

The average velocity of the wind was $4\frac{1}{2}$ miles an hour.

There were 213 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There was but one day on which no sunshine was recorded.

July.—The weather conditions of this month were fairly normal, its chief outstanding features being a marked excess of bright sunshine, and a less notable excess of warmth. There were some occasional cool nights, and except over a few districts in the North, now and again slight ground frosts, but fortunately these were not sufficiently severe to do much damage to vegetation. In addition the month was unusually dry over the northern half of the kingdom, but less so in the south, and particularly the south-east, of England, where, owing to some heavy downpours during its closing days, the normal fall was largely exceeded. At Wisley, and over the Thames valley districts generally, the total for the month was between twice and three times the usual amount; but the absence of rain during the earlier weeks had been the cause of much trouble in the Gardens, many plants, and more especially strawberries, suffering greatly from drought.

The mean results of the Wisley observations are given in the following table:

Mean temperature of the air in shade	61·8°	
Highest ,, ,, ,, ...	79°	on the 14th
Lowest ,, ,, ,, ...	45°	,, 10th
Lowest ,, on the grass	35°	,, 10th
Number of nights of ground frost		nil

	At depth of 1 ft.	At depth of 2 ft.	At depth of 4 ft.
Mean temperature of the soil at 9 A.M.	62·8°	61·5°	58·2°
Highest " " "	67°	65°	61°
Lowest " " "	58°	59°	57°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 77 per cent.

Rain fell on 13 days, to the total depth of 4·75 in. (equivalent to about 22 gallons of water to the square yard). Heaviest fall on any day 1·75 in., on the 30th.

The prevailing winds were at first from north-east, then from south-west.

The average velocity of the wind was 4 miles an hour.

There were 215 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

August.—It is not unusual for the weather during August to exhibit some feature not generally associated with that of a mid-summer month, but fortunately it is not often that it combines at once so many peculiarities as it did in the month now under review. It may be summarized as disturbed and unsettled, very windy and dull; with a marked deficiency of sunshine and warmth; and, as regards the greater part of the kingdom, an excessive rainfall. The month opened with squally, rainy weather, and a continuance of the heavy rain-storms which had been so conspicuous a feature of the weather over the south-eastern counties since June. As a result, the total rainfall amounted in many districts to double, and in some to treble, the usual amount; and in parts of Surrey, Kent, and Essex, where the rain-storms were especially severe, there fell during the first week amounts which were from ten to twenty times greater than the normal. With such conditions there was, as might have been expected, but little bright sunshine; and as a further result the days were very cool; although, since the screen of cloud which cut off the direct rays of the sun by day served also to prevent the radiation of heat from the earth by night, these were followed by unusually warm nights, resulting in a higher *average* temperature than would otherwise have been the case. But these conditions were not altogether unfavourable to the horticulturist. The extremely heavy, but fortunately not very prolonged, "downpours" were not welcomed; but the abundance of moisture and the unusual warmth at night more than compensated for the loss of sunshine and heat by day, with the result that at Wisley, and in most other districts, extraordinary progress was made in plant-growth right through the month.

The observations made at Wisley are summarized in the following table:

Mean temperature of the air in shade	61·1°	
Highest " " "	76°	on the 7th
Lowest " " "	48°	" 20th
Lowest " on the grass	38°	" 20th
Number of nights of ground frost		nil

	At depth of 1 ft.	At depth of 2 ft.	At depth of 4 ft.
Mean temperature of the soil at 9 A.M.	62·2°	61·8°	59·7°
Highest " " "	65°	64°	60°
Lowest " " "	60°	60°	59°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 81 per cent.

Rain fell on 22 days, to the total depth of 4·04 in. (equivalent to about 19 gallons of water to the square yard). Heaviest fall on any day 1·22 in., on the 1st.

The prevailing winds were at first north-westerly, then from south-west.

The average velocity of the wind was 7 miles an hour.

There were 171 hours of bright sunshine, equal to 38 per cent. of the greatest possible amount.

There was but one entirely sunless day.

September.—Like its immediate predecessor, this month was a very windy one, the prevailing direction of the wind being westerly, and its chief characteristic its gustiness rather than its exceptional strength, the force of a gale being seldom reached. But in contrast to the very wet August it was a dry month, the rainfall being as a rule much below the average, although in a few districts there were exceptions, owing to thunderstorms and heavy local rains, which, however, only affected very limited areas. But, like August, it was again a moderately warm month, and owing to a similar cause—the high average daily temperature being due to exceptionally warm nights rather than to very hot days. But in most districts the fresh, gusty, westerly wind proved to be very useful to the agriculturist, enabling him to dry his corn after the soaking the stooks had in the drenching downpours of August; so that on the whole the weather of the month may be fairly summarized as having been seasonable, and good for harvest, and indeed all operations on the land. There was again rather less than the average amount of sunshine, but this was less noticeable at Wisley, and indeed over the whole of southern and south-eastern England, than in the northern parts of the kingdom; and the generally favourable climatic conditions of the month, from the horticulturist's point of view, was evidenced by the quite unusual progress which continued to be made by all out-door plant life throughout.

The observations made at Wisley are summarized in the following table:

Mean temperature of the air in shade	58·6°	
Highest ,, ,, ,,	75°	on the 11th
Lowest ,, ,, ,,	41°	,, 28th
Lowest ,, on the grass	28°	,, 28th
Number of nights of ground frost		2

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	59·8°	59·8°	58·6°
Highest ,, ,, ,,	62°	61°	59°
Lowest ,, ,, ,,	56°	58°	58°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 84 per cent.

Rain fell on 12 days, to the total depth of 1·50 in. (equivalent to about 7 gallons of water to the square yard). Heaviest fall on any day 0·37 in., on the 17th.

The prevailing winds were south-westerly.

The average velocity of the wind was 5 miles an hour.

There were 57 hours of bright sunshine, equal to 46 per cent. of the greatest possible amount.

There were three days on which no sunshine was recorded.

October.—Taking a broad view of the weather of this month it may be summarized as windy and wet, with a mean temperature consider-

ably below the average; and therefore over the greater part of the kingdom it was by no means an ideal month for the horticulturist or the farmer. Everywhere it was very unsettled; the first few days were warm, and at Wisley on the 2nd the thermometer rose to 71°; but then there ensued a long spell of cool westerly winds, sometimes blowing very strongly, and during their continuance the thermometer often failed to reach 50° in the warmest part of the day, and at night occasionally fell below the freezing-point in the screen, four feet above the ground, whilst the thermometer laid upon the ground recorded a frost nearly every night, the most severe being 18° below the freezing-point on the night of the 27–28th. The rainfall also everywhere exceeded the average amount, the excess being as a rule about 50 per cent., but in some districts very much more, and in the north and north-west more or less rain fell every day. This abnormal frequency necessarily interfered with gardening and agricultural work—early sowing of grain was prevented in some districts, and indeed in places in the far west a good deal of hay and corn still remained in the fields, awaiting a chance for the crops to dry sufficiently to be harvested. In other regions, however, there was a fair amount of sunshine as well as of rain. At Wisley more or less was recorded on thirty days, the average daily duration being four and a half hours; and over the eastern parts of England about an hour a day in excess of the usual amount was recorded pretty generally. The combination of unusual sunniness with an abnormally large rainfall, and exceptional cold, did not entirely check the vigorous growth of trees and shrubs, noticed at Wisley in the earlier months of the year, until this month had nearly closed; but the display of colour and tint in the foliage during the last fortnight was unusually fine.

The Wisley results are as follows:

Mean temperature of the air in shade	46·8°	
Highest ,, ,, ,, ...	71°	on the 2nd
Lowest ,, ,, ,, ...	25°	,, 28th
Lowest ,, on the grass	14°	,, 28th
Number of nights of ground frost		21

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	50·1°	52·2°	53·9°
Highest ,, ,, ,, ...	57°	57°	57°
Lowest ,, ,, ,, ...	44°	48°	50°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 16 days, to the total depth of 3·29 in. (equivalent to about 15½ gallons of water to the square yard). Heaviest fall on any day 0·52 in., on the 12th.

The prevailing winds were westerly.

The average velocity of the wind was 6 miles an hour.

There were 137 hours of bright sunshine, equal to 42 per cent. of the greatest possible amount.

There was but one entirely sunless day.

November.—Throughout this month the weather over the greater part of the kingdom presented a sharp contrast to that of October, it being dry and sunless, but yet warm. At the same time in one other

respect it resembled that of the earlier month, it was very windy, and largely on that account it proved to be a capital month for work on the land, more especially after the first week, by which time the ground had dried sufficiently to allow all out-door operations to be easily carried on. From districts in the north and west, which are usually backward compared with those farther south, there came reports that all potatos and roots had been harvested in good condition; and with them equally satisfactory reports of progress having been made generally with ploughing and winter sowing. At Wisley the open weather allowed all work in the Gardens to be satisfactorily and easily carried on, and the general conditions were described as "capital." The mean temperature was nearly everywhere above the normal, a result which was again due to the absence of cold nights rather than to very warm days; for the amount of bright sunshine recorded was generally less than the average, and the amount of cloud, and over some northern districts of rain also, was considerably above it; conditions which were mainly due to the continued persistence of winds from a westerly quarter.

The mean results from the Wisley observations are as follows:

Mean temperature of the air in shade	46·2°		
Highest „ „ „	60°	on the	2nd
Lowest „ „ „	29°	„	26th
Lowest „ on the grass	17°	„	26th
Number of nights of ground frost			11

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	46·8°	48·0°	49·5°
Highest „ „ „	50°	50°	50°
Lowest „ „ „	44°	47°	49°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 90 per cent.

Rain fell on 11 days, to the total depth of 0·87 in. (equivalent to about 4 gallons of water to the square yard). Heaviest fall on any day 0·30 in., on the 26th.

The prevailing winds were westerly, south-west to north-west.

The average velocity of the wind was 6 miles an hour.

There were 50 hours of bright sunshine, equal to 19 per cent. of the greatest possible amount.

There were 8 days on which no sunshine was recorded.

December.—The weather throughout the closing month of the year resembled very much that with which the year had opened, inasmuch as it was both cold and dry all over the kingdom. It was, however, seasonable weather, and little or no damage was done by the severe frost, since the fine weather of the preceding month had enabled farmers and others to secure their crops and place them under cover. A good proportion of the precipitation fell as snow, but the combined total of snow and rain was everywhere much below the average amount, and in many districts it was less than any December total had been for many years. But not only was the month a dry one, it was also unusually bright. The amount of bright sunshine recorded in December can, of course, never be other than relatively large; but this year there were days on which so many as six hours of continuous sunshine

were recorded at Wisley, and an hour more at a few favoured spots on the southern coast; and the average *daily* duration at Wisley for the whole month—taking dull days with bright—was rather more than one and a half hours, which is nearly 50 per cent. more than the average. This simply means that the sun's rays when focussed through a special lens had sufficient power to scorch a strip of card for a total of fifty-two hours, during the twenty-one days on which it shone at all; and although this may not appear to be a very large amount, it really is so for December, especially if it be compared with another December record obtained in 1890, also in Surrey (and not very far from Wisley), when the total amount for the entire month was only fifteen minutes! But notwithstanding the unusual abundance of sunshine this year, out-door plant life at Wisley was by no means vigorous: there were no signs at all of flowering on trees, such as Hamamelis; and only one or two flowers appeared on Hellebores; and, indeed, plant life in general was in a more backward state than had been observed in December for some years.

The following table summarizes the results of the climatological observations made at Wisley during the month:

Mean temperature of the air in shade	35·3°	
Highest ,, ,, ,,	53°	on the 1st
Lowest ,, ,, ,,	16°	,, 19th
Lowest ,, on the grass	6°	,, 19th
Number of nights of ground frost		19

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	39·4°	42·5°	45·7°
Highest ,, ,, ,,	48°	48°	49°
Lowest ,, ,, ,,	36°	39°	42°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain fell on 10 days, to the total depth of 1·45 in. (equivalent to about 7 gallons of water to the square yard). Heaviest fall on any day 0·63 in., on the 16th.

The prevailing winds were south-westerly till the last week of the month, then north-easterly.

The average velocity of the wind was 5 miles an hour.

There were 52 hours of bright sunshine, equal to 22 per cent. of the greatest possible amount.

There were 10 days on which no sunshine was recorded.

NOTES FROM THE WEATHER DIARY OF AN OFFICER IN THE B.E.F. 1915–1918.

By MAJOR C. L. WARD-JACKSON.

NOTHING could exceed the dreariness of the winter 1915–16. I was attached to the Headquarters Staff of a Corps which had taken over in the previous July from the French a portion of the Front Line opposite the villages of Gommecourt and Serre of gory memory.

Until the arrival of the British this part of the front had been almost peaceful. Peasants worked on their fields within easy range of hostile field artillery, and even of machine-guns. It was possible in places to ride on horseback within view of the enemy's front trenches and spy them through a glass without evoking the stuttering protest of an angry Maxim concealed in its emplacement of German concrete. Indeed a French villager related to me how a truce was always declared at the hour of *déjeuner* between a French battalion on one side of No-Man's-Land and a German battalion on the other, and each party on fine days scrambled out of its trench into the open and partook, unmolested, of the midday meal in full view of the enemy. Despatch-riders rode their machines backwards and forwards to Battalion Headquarters with little more fear of gun trouble than at home, while aeroplanes were almost always, except for their curiosity, politely behaved.

Things livened up considerably after the arrival of the British, full of pride now in an increased supply of gun-ammunition and very wrathful against the Huns, whose unwelcome attentions they had had strenuously and patiently to bear for many months further north. Yet even now Staff Officers in their motor-cars could daily be seen entering Hébuterne, which was almost in the Front Line System, while the artillery on either side chiefly fired when the respective C.R.A.s wanted to let the other fellows know that they were awake and entitled to some respect, and when the British wanted to show, by Jingo ! that they had actually two rounds per gun to spare.

As winter approached, down came the rain and with it increased activity and discomfort, together with a far greater tension between the opposing armies. And certainly the weather was not conducive to Christian charity. There was scarcely any snow and but little more frost the whole winter until the end of February, when we had severe frost and blizzards, in one of which the Huns attacked at Verdun. It rained and rained instead. During December rain fell on twenty-four days, and a wet, mild, and blustery Christmas Eve culminated in a heavy thunderstorm in the afternoon.

March and April of 1916 were bitterly cold ; May and June were

very little better, but July 1, 2, and 3, the first three days of the Battle of the Somme, were fine and warm, even if the wind were, as it ever is, in the wrong quarter for our gas. These were immediately followed by the disastrous four wet days which effectually precluded our taking full advantage of the great successes we had gained in the southern part of the battlefield. The weather afterwards improved, but it remained cold, and the end of August brought day after day of rain and chilly north-west wind and the consequent breakdown of the Somme roads. The clerk of the weather has indeed been no friend of the Allies in this War. He has on the contrary showered unending and incalculable blessings on our enemies.

September was very cold, and I only note six days in the month with wind from south or west: on all the others there was wind from north-west or east, a most unusual condition for the month. October and November were normal, but there were six consecutive days of extraordinarily dense fog from November 28 to December 3. December was again a month of rain and floods with mild temperature.

Wintry weather set in on January 14, and on January 20 began the wonderful frost of 1917. From that date until February 15 the most rigorous severity prevailed, and the daily minimum temperature from January 22 till February 11 actually averaged 11·24° Fahrenheit, or 20·76° of frost per diem! The hardest frosts were on January 28 and February 9, 29° and 27° respectively. There was a recrudescence of this long winter during March, the thermometer registering frost on sixteen days, but it was less severe.

The early spring of 1917 was exceedingly tempestuous, and the Battle of Arras commenced amid driving snow-storms, very trying to the fighting troops. I saw the first swallow on April 23 and heard the first cuckoo on May 1.

The summer of that year was as remarkable in its way as the previous winter had been. Between May 21 and June 20 the maximum shade temperature fell below 70° on only three days, the highest reading being 84° on June 18; while from June 20 till October 4 it never upon one single day fell below 60°. During this period of 106 days the thermometer showed 80°, or over, only twice; but it exceeded 70° on forty-four days. Only on fourteen days did it not reach 65°. As to the minimum daily temperature, the mercury never fell below 50° from June 4 till September 20.

Thus the summer of 1917 was exceptionally equable. Moreover, it was fine and sunny without being droughty, and it would be hard to find a more lovely month than September of that year.

The remainder of the autumn was uneventful from the weather point of view, and our opinions were much divided as to the winter's prospects. Most of us thought we would be let off easily after the rigorous experiences of the previous winter. We were wrong. The arctic spell began at an earlier date: that was the only difference. It froze on December 10, and from that day till January 9 winter held us in a grip of iron. We had 21° of frost on December 23 and 26° on

January 8, 1918, and the mercury stood at 22° Fahrenheit, or less, on twenty-one occasions during this period.

In February I left France and thus missed (with but faint regrets !) the pernicious and deadly fog in the morning of March 21, which was the most wonderful stroke of luck for the Huns in their great attack that the most diabolical imagination could devise.

Surely, now that it has done its worst for our side, we may hope for a change in Fortune's wheel as regards the atmospheric conditions. None but sailors at sea and soldiers at the front can realize how potent a factor in this War is the weather.

PRESERVATION OF CROPS FROM INJURY BY FROST.

By Alexander McAdie,
Professor of Meteorology at Harvard University, formerly in charge of the Weather Service of the United States for California.

Throughout Christendom at the present moment the uppermost topic of discussion is food. The outcome of the war for Liberty, as we believe it to be, will depend largely upon the supply of food. In the countries of the Allies as well as in Central Europe every effort is being made to increase the crop yields. This is done by increasing the acreage and by intensive cultivation. Fertilizers are used as never before, and where formerly a few tons of manure were regarded as sufficient for an acre of ground, to-day in places one hundred tons are employed. Farming operations are carried on during the night as well as the day, labourers go to their work in shifts so that no time may be lost, tractors do the work of many horses, and in every direction there is striving for a maximum yield. Those of us who are not farming or gardening do our bit by lessening the demand, practising economy, and preventing waste. In this last-named effort, namely, the prevention of waste, it would seem wise at this time to study natural wastage, for Nature itself is the master spendthrift; and the loss by natural conditions, such as pests, drought, and frost, may easily exceed the savings of the community for a long period. Now is the time, if ever, when united and properly directed effort should be made to reduce the loss occurring through frost. In this paper we shall not stop to consider spring frosts and the losses due to tender vegetation, reserving this discussion for a later paper, but shall consider only the *autumnal* frosts, when vegetation is advanced and nearly ready for the harvest; and when loss therefore is doubly disastrous.

We shall consider the theory and practice of frost-fighting, first from the aerographer's standpoint, and later from the grower's point of view.

I.

Frost, in the general acceptance of the term, means a temperature of freezing or below, and of sufficient duration to result in damage to the cell tissues of plants near the ground. The loss of heat from both ground and plant is chiefly caused by radiation. The control is the flow of air plus water vapour near the ground. In other words, frost is to be regarded as a problem in *local air drainage*. The duty of the forecaster is to detect and give warning when conditions favour local stagnation and intense radiation. Can this be done successfully? Yes. For these conditions may be expected when an area of low pressure or surface depression moving rapidly eastward is followed by

an equally rapid in-moving high. There results boisterous west to north winds, subsiding as night approaches. Then comes a period of stillness and there is no mixing or churning of the air. With the cessation of convectional currents there is also diminishing amount of vapour and haze or dust. The first law of frost-forecasting is that conditions must favour the surface inversion of temperature characteristic of still, clear nights with dust-free atmosphere and low humidity.

Air can flow in any direction, and the forecaster will follow closely the great displacements in horizontal directions ; but in dealing with frosts of the late autumn and early winter he must be keenly alive to the action of slow, vertical currents, chiefly descensional. These slow-moving surface currents, which might be called *creeping* currents, complete the fall in temperature which the larger horizontal movement began. Marked inversions take place after the cyclonic winds have calmed down. Then begins what might be called local air drainage, and the formation of ponds of stagnant dry cold air. On windy nights there is little likelihood of frost, and the temperature is as a rule higher, because there is thorough mixing. It should not, however, be forgotten that wind favours evaporation, and, unless from a water surface, tends to dry and cool vegetation. Again, temperature is largely controlled by humidity, and if there is much moisture present the amplitude or range will be small. More important still, the rate of cooling will be a minimum. Therefore, when high humidities are reported the probabilities are that there will be no frost. On nights when frost is anticipated, data showing temperature gradients in a vertical direction will help the forecaster. If special readings can be made of two similar thermometers not in shelters, one 100 millimètres above the soil and the other a mètre higher, these will help. On frosty nights the minimum temperature is found to occur not on the soil itself, but about 10 millimètres above. With regard to data from wet-bulb thermometers there is some uncertainty, because unless a sufficiently low dew-point be obtained the readings may mislead. The trouble is that, as generally obtained, the wet-bulb reading is not low enough, because proper provision has not been made for determining the amount of air passing over the wet bulb in a given time. While sling psychrometers and whirled psychrometers improve matters somewhat, still there is no way of knowing definitely how much air has passed over the wet bulb. It is assumed that the distance travelled by the wet bulb is practically equivalent to an air flow of three or four metres per second, and that this is adequate ventilation. But, of course, there should be a definite time and a definite radius of rotation, or else each observer will report a depression of the wet bulb, depending upon his own idea of what constitutes a sufficient ventilation. With the whirled psychrometer it is possible at small expense to improve matters by adding a small toothed disk and a cheap spring bell. Thus an instrument which the writer uses sounds the bell for every 100 revolutions, and with watch in hand the speed can be easily regulated to 100 revolutions a minute. To get the true depression the whirling

should be continued fully five minutes. It is necessary to emphasize this point, because one reason why the dew-point fails to indicate the minimum temperature of the coming night is faulty manipulation.

The theory that the succeeding minimum will not be below the dew-point presupposes that both general and local conditions will remain constant, and while in general at times of frost conditions do remain unchanged, there are exceptions. If the humidity is high when the observation is taken near sunset, the chances are that the dew-point will be two or more degrees centigrade above the night minimum. If, however, the station is in the lowlands and the instruments not far above the soil, the readings will not fairly represent the temperatures of the lower air mass. It would be better to get the dew-point at higher levels.

The forecaster should have before him a rather detailed topographical map with contours for every ten mètres. He must appreciate the trend of valleys and differentiate between valleys more or less walled in and those which are open, particularly those open to the sea. The inclination of ridges to the prevailing winds is of some importance. A comparatively slow flow of air will prevent frost unless the air in its passage over higher land has been dynamically dried. Such air in its descent may gain in heat, but not enough to offset the cooling due to contact with the soil cooling rapidly by radiation. The forecaster, then, carries a mental picture of basins filling with dry cold air from rather shallow streams. These ponds are only a few mètres in depth, and are capped by a layer of much warmer air widely spread. And this is what we mean by *inversions*; the cold air is down and cannot get up; the warm air is up and cannot get down, and there is marked stratification within a few mètres from the ground.

Besides the topographical map the forecaster must know something of the nature of the soil, for this is important in determining what may be called the effective radiation. Dark soils and certain covers * will radiate more rapidly, and hence show lower temperatures. The general forecaster can hardly be expected to be an expert for all localities, hence it is a good plan to have in selected districts a local forecaster, preferably an agriculturist who knows something of soils, and also the relative susceptibility of different plants to frosts. He will know where the land has been ploughed and where it has been left unbroken, the crop cover, the presence of wind-breaks, and the minor slopes.

For crops on hillsides the factor of safety is large. Protection comes from both mixing the air and the warmth derived from the great reservoir of warm air which we have described as lying above the cool air. During the night hours the air moves toward the hill-sides, and whatever convectional changes take place, the resultant

* The *streakiness* of frost even on a nearly level field may be due, first, to differences in thermal capacity of soil and cover, and second, to the minor circulations thus established. For example, over a dark soil the cold air will settle, forcing warmer air elsewhere. And as even a slow flow will prevent frost, we find frost-free areas not far from frosted areas.

circulation is the slow drift of overspreading warm air toward the slope.

The forecaster's great aids are cloudiness and wind. If the observations show conditions favouring cloud-building, which means strong convectional currents, there is little danger of frost. The cloud cover is Nature's own way of preventing frost. Even a fine veil of upper cloud will suffice.

In the main, frosts occur when an anti-cyclone stagnates, if we may so express it. The circulation at the surface is certainly sluggish for a period of forty-eight or seventy-two hours. This is why frosts recur, with the minimum temperature getting lower on successive nights. The rapid dying out of convectional currents before sunset, a low percentage of saturation, and a tendency of the dew-point to go lower are all favourable for frost.

II.

The problem of protection, from the agriculturist's point of view, will now be considered, it being assumed that forecasts of frost have been received. Forewarned is forearmed! But not in this case, unless the grower has prepared a supply of fuel, covering material, water and sand, or fine ash, preferably wood-ash. It will not do to wait until frost comes.

First, how shall we prevent cooling near the ground? The easiest way is to conserve the earth's heat by covering the plants with cloth, paper, straw, or by a suspended cover of dense smoke, generally called a smudge, and most easily produced by sprinkling water on small fires made of brushwood. This causes a thick heavy smoke, and all things considered is the cheapest and most effective protection against frost.

Another method is to apply heat directly in the shape of open small fires or fuel in fire-baskets, or by the so-called orchard heaters, which are essentially metal containers holding less than a gallon of oil and arranged for slow burning. Large open fires are not effective, because they warm the higher levels where the heat is not needed. Indeed, the problem really consists in displacing or heating a comparatively shallow stratum of air close to the ground. There is therefore no gain in burning bonfires unless in some way a circulation can be established and the warmer upper air brought down. Unfortunately in most instances this is not the case, and the surface cold air is simply replaced by other cold air. The slight gain due to mixing and motion is incommensurate with the fuel used.

Another method would be to mix the air, establishing a circulation by blowers or windmills; and still another method would be the use of substances with high specific heat, which had previously been heated. Such agencies would be water, sand, and wood-ash.

The first method, that of covering, was practised on a small scale by our grandmothers, who covered at sundown their favourite rose-bush

and nearly always saved it from frost. The theory is simply this, that any cover intercepts the re-emitted heat waves going from the ground to space. These are not exactly the same heat waves which were received during the day, being much longer, having approximately wave-lengths of 0·012 millimètre. These longer waves are more easily trapped or intercepted. Any medium—cloth, paper, smoke, or floating ashes—that interferes with free radiation stops the outflow and loss of energy in the form of heat waves and is in this sense a protective frost cover.

The best type of cover is a cloud; and clouds, whether high or low, are good frost protectors. When we can make artificial clouds we can eliminate frost.

It is an advantage to cover *early*; indeed, an hour or two *before* rather than after sunset. Newspapers, cloth screens, fibre screens can be used. If soft material is employed, especially paper, there may be wetting, and so in the long run it will be found cheaper to employ weather-proof material. It is also important that the material used be properly fastened and kept in place.

The method of direct heating has met with much success in the orange groves of California and elsewhere. Modern heating methods date from experiments begun by the writer in that State in 1895. The fuel originally used was coal; later wood, straw, and brush were used, now however supplanted by crude oil or distillate. With modern orchard heaters, about thirty to the acre, the temperature can be maintained 3° C. above freezing, thus preventing refrigeration of plant tissues.

The method of utilizing the heat of higher levels by ventilation has not been commercially developed. The method of applying water either in spraying or by running ditches or flooding has proven entirely successful. The method of sanding, cleaning, and draining over boglands is effective.

One other important consideration remains, and that is injury of plant tissues due to rapid rise in temperature *after* the frost. Defrosting if too quick may result in damage where no damage was effected by the low temperature. In this connexion water may be used to advantage, for both water and water vapour have high specific heat as compared with air; roughly, water has four times the capacity for heat that air has. It is essential that the restoration of plant juices and tissues to their normal state be accomplished gradually, neither too rapidly nor yet too slowly. There is probably an optimum temperature for thawing or defrosting frozen fruits and vegetables. Finally, temperature records need careful interpretation. The freezing-point of liquids under pressure in the plant cells or exposed at the stomata may be different from free air values. Air gains and loses heat chiefly by convection or translation. Losses by conduction are small. Plants gain or lose heat by radiation, convection, and conduction of an internal character. Soil gains and loses heat by radiation and conduction. The loss of heat in the air stratum near the ground

is due first to convection and horizontal translation of the air, then by contact with the soil cooling rapidly by free radiation.

Frosts are recurrent phenomena, and may reasonably be expected within certain dates. The cumulative losses are considerable. To be serviceable the protection must be available for several nights in succession, for there is no profit in saving a crop one night and losing it on the following night. The effort to protect is worth while.

TREES AND SHRUBS FOR AUTUMN AND WINTER EFFECT.

By C. R. Fielder, V.M.H.

[Read September 11, 1917; Mr. E. A. Bowles, M.A., V.M.H., in the Chair.]

The planting of trees and shrubs for the sake of the autumn tints of their foliage, their brightly coloured berries, or the colour of their bark in the winter, appears until comparatively modern times to have been chiefly confined to the Holly, the Mountain Ash, and perhaps the silver-barked Birch.

Of course, we have always had the Elm—a cloudy mass of gold in the autumn, almost if not quite unsurpassed by any other tree—the slightly less conspicuous yellows of the Hornbeam and the English Maple, and the rich browns of the Oak and the Beech. But the Oak, Elm, and Beech, when planted in the pleasure-grounds or park, were probably introduced on account of their beauty as timber rather than for the autumn colouring of their leaves.

A new era may be said to have begun upon the introduction of the Virginian Creeper in 1629, followed at various intervals down to the present time by the American Scarlet Oaks, and Maples from different parts of the world, those from Asia including the brilliant-foliaged Japanese Maple, *Acer palmatum*, and its varieties, with their curiously divided leaves.

Many other trees and shrubs having coloured autumn leaves and fruits of varying degrees of brightness have been and are still being introduced, notably many Berberis, Cotoneasters, Vitis, and Viburnums from China, so that for some years there has been no lack of good material for the brightening of the garden in the autumn and winter; but nothing like full use has yet been made of the many trees and shrubs that are available for that purpose.

Although some of the trees I have mentioned have long been in this country, their distribution appears to have been slow. The great advance that has taken place in horticulture during the past thirty years or so has, however, afforded opportunities for their freer use. These opportunities have been embraced by many, while other gardens may still be seen where the planting of shrubs for autumn colour has been almost entirely confined to the Sumach and the Ampelopsis.

The splendid exhibits of autumn foliage shown in the Hall for some years past have afforded ample proof of the wealth of material that gardeners now have at their disposal.

The best effects are obtained when the trees or shrubs are planted in groups, which may vary in size according to the extent of the garden,

and should be situated where the sun has full access. This is essential if the full beauty of the autumn colouring is to be secured, but its importance is too often overlooked. It is the summer sunshine that produces the bright-coloured bark, and the fruit on berry-bearing shrubs; and it is the gleam of autumn and winter sun which lights up and intensifies the colouring of leaf, bark, and berry.

The point of view should also be taken into consideration when planting. With very few exceptions the trees should be so planted that they may be seen with the sun behind the observer. The full effect of autumn foliage, and berries and bark in winter, depends almost entirely upon this. Almost the only exceptions to this rule that I have noticed are the Claret Vine and *Acer Schwedleri,* whose semi-transparent red leaves are equally beautiful whether viewed with the back or the face to the sun.

Trees and shrubs for autumn and winter effects should be planted in prominent positions. Too often, through mistakes when planting, or neglect of subsequent thinning, much of the effect is lost, just sufficient remaining to show what beauty there might have been had the trees been given sufficient room to develop.

In thinking of the taller-growing trees that are suitable for our purpose, one of the first to come to mind is the American Scarlet Oak, *Quercus coccinea.* Trees of this raised from seedlings vary somewhat in the colouring of the leaves, but, all things considered, it is one of the most satisfactory trees to plant. It grows quickly, for an Oak, and requires plenty of room, and therefore it is even more suitable for the park than the pleasure-ground. It is always pretty, and frequently gorgeous in its autumn colouring. There is a very bright-coloured form which is propagated by grafting, the leaves of which remain on the tree much later than those of seedling scarlet Oaks.

Quercus rubra is another fine Oak with large leaves, which are of a darker red than those of the Scarlet Oak.

Some of the larger-growing Maples are almost as brilliant as the Scarlet Oak. The Norway Maple, *Acer platanoides,* makes a fine tree, and its large leaves turn a rich golden colour in the autumn. One of its varieties is *Schwedleri,* with large purplish leaves, which change in the autumn to a bronzy-red colour. This is a fine quick-growing tree. Another equally good variety is *Reitenbachii.* *A. saccharinum,* the Sugar Maple, is another of the taller Maples with bright autumn leaves. *A. pictum* and *A. pictum aureum* have rich yellow leaves, and *pictum rubrum* red leaves in the autumn. They are much smaller-growing trees than those previously named, and so also is *A. tataricum Ginnala,* which has a very graceful habit of growth, and foliage which becomes beautifully tinted. The still smaller and more brilliant Japanese Maples will be dealt with when we come to the lower-growing shrubs.

The Tulip Tree, *Liriodendron tulipifera,* in addition to producing its fragrant, tulip-shaped, orange, yellow, and green blossoms in the

summer, makes another grand display in the autumn, when the foliage changes to a rich yellow colour.

Liquidambar styraciflua is a beautiful tree with leaves resembling those of some of the Maples. The colour changes in the autumn to a bright red. This tree likes a moist loamy soil. The brightest-coloured specimen I have seen was growing by the side of a lake, about 3 feet above the water level.

Among the Coniferæ there are several trees that are valuable for their winter colouring. Where there is room for *Cedrus atlantica glauca* few will deny themselves the pleasure of possessing this beautiful silvery-leaved tree. It is, of course, silvery in the summer as well as in the winter, and so also is that most beautiful of all spruce firs, *Picea pungens glauca*, which is commonly known as the Blue Spruce.

The foliage and shoots of *Cryptomeria elegans* are dark green until the approach of winter, when they change to a bronzy-red, which is very attractive, and forms a fine contrast to conifers with silvery or golden foliage. *Cupressus Lawsoniana lutea* retains its yellow colour throughout the winter, and the foliage of *C. Lawsoniana Allumi* is of a bluish tint. There are many others, but these are a few of the most distinct.

In the generality of gardens there is more room for shrubs than for taller-growing trees; therefore it is fortunate that among the lower-growing species there is a wide choice of beautiful subjects for providing autumn and winter colour, either by means of leaf, berry, or bark.

We will first make a selection from those having coloured leaves. The Japanese Maples are pre-eminent for the brilliancy of their autumn colouring, and in the case of many varieties the young foliage is equally attractive in the spring. This makes these Maples doubly valuable. The young shoots are rather liable to be injured by late spring frosts, and for that reason it is wise to plant in a position where the early morning sun cannot shine on the trees while they are frozen. These Maples are varieties of *Acer palmatum*, and probably the most brilliantly coloured variety is *atropurpureum*, though nearly all are more or less attractive. The leaves of some of the varieties are very curiously mottled. Japanese Maples are slow-growing, and should not be planted where they are likely to be overgrown by stronger-growing shrubs. They love a deep loamy soil.

In soils that are free from lime, the deciduous Azaleas (or Rhododendrons as they are now named) of the Ghent and Ponticum groups, should be freely planted. These have flowers of many delightful shades, which are followed in the autumn by leaf tints that are equally charming. They are very suitable for the pleasure-ground, and may also be planted in the more open parts of the wood.

Amelanchier canadensis is another shrub which provides a rich autumn display, and is also one of our prettiest spring-flowering shrubs. Its popular name, the 'Snowy Mespilus,' well indicates the appearance of a good specimen in full bloom. It is sometimes grafted on the

whitethorn, therefore suckers must be watched for, and promptly removed when seen.

Very striking is the autumn colouring of *Parrotia persica*. Some of the leaves may be crimson, some yellow, and others pale yellow, margined with light crimson. This shrub grows freely, and is not fastidious in the matter of soil. The foliage is retained longer than that of most deciduous shrubs.

The Rhus family, better known as the Sumachs, is a brilliant one, but it contains a black sheep which, possibly on account of its bad character, sometimes goes under the respectable name of *Ampelopsis Hoggii*. Its real name is *Rhus Toxicodendron*, a climber with leaves resembling the Virginian Creeper, and they assume a very brilliant colour in the autumn. It is, however, very unwise to plant it, as persons handling it are liable to suffer from very serious skin eruptions. The other well-known Sumachs are thoroughly desirable shrubs, of most gorgeous autumn colouring. These include *Rhus typhina*, *R. glabra* and its variety *laciniata*, *R. Osbeckii*, and the dwarfer species, *R. copallina*.

Pyrus arbutifolia is a shrub with flowers resembling May-blossom, which are succeeded by dark-red berries. The shiny dark-green leaves turn a brilliant red colour. The foliage of some of the Berberis family colour well, the most beautiful species being *B. Thunbergii*.

Euonymus alatus is one of the Spindlewood family, and the beauty of its autumn leaves is hard to beat.

Other good shrubs are *Cornus Kousa*, *C. florida*, *C. Nuttalli*, and *Ribes americanum*.

There are many trees and shrubs with more or less brightly coloured bark, and the eye dwells on these with pleasure when the last of the leaves have fallen, and the birds have eaten the berries. *Salix ramulis aureis* is a very quick-growing willow, of graceful drooping habit, with very long whip-like shoots, and pale-yellow bark, which, when lit up by the sun, is very beautiful throughout the winter. *Britzensis* is a good willow with red bark.

The Dogwood family gives us *Cornus sibirica*, *C. sanguinea*, and *C. stolonifera* with red shoots, and the variety *flaviramea* with yellow shoots.

Acer pennsylvanicum, the snake-barked Maple, has smooth green bark on the stem and branches, which splits open lengthwise, showing clear white stripes. The young shoots are bright red. It is altogether a very pretty tree.

Very few people will overlook the Silver Birch, whose stems are almost as conspicuous under the moon as in the daylight.

The red hairy stems of *Rubus phœnicolasius*, also known as the Wine Berry, which ripens its pretty fruits in August, the equally red stems of *Rosa nitida* and *lucida*, both of which have bright-red autumn leaves, *R. rubrifolia*, with its plum-coloured bark showing through a thin white bloom, all help to brighten the garden in the winter season. So also do the whitewashed brambles, *Rubus*

leucodermis, *R. biflorus*, and other newer species, although these are more at home in the wild garden, where they may have room for full development, when the tall white stems are very effective.

The young shoots of *Berberis virescens* are brightly coloured, and the berries are a darker red than the common Barberry.

The bark of *Arbutus Andrachne* and *Taxodium sempervirens* is of a ruddy-brown colour, which becomes more conspicuous as the trees increase in age.

In the case of deciduous shrubs with bright-coloured bark, the effect depends largely upon the quantity and length of the young shoots. It is therefore frequently the custom to cut such shrubs as *Cornus sibirica* and *C. sanguinea*, and the red-barked willows, back closely at the end of the winter, which causes them to throw up strong shoots which colour very brightly.

There are numerous climbers with brightly coloured leaves, and their number is continually being added to. When *Ampelopsis hederacea*, the Virginian Creeper, was first introduced, it must have caused a sensation in the garden, and this old climber is still one of the best. Unlike *Ampelopsis Veitchii*, which clings like ivy, the Virginian Creeper requires assistance in reaching the eaves of the house or the branches of an old tree, but after that it may be left to drape the gable with its long red streamers each autumn, and arrange festoons among the branches of the tree.

Ampelopsis Veitchii, since its introduction from Japan in 1868, has largely superseded the Virginian Creeper as a wall plant. This is due to the rapidity with which it climbs without help, and to the greater brilliancy of its autumn colouring. If it has a fault it is its almost too trim and tidy appearance. *A. muralis* and *Engelmannii* are other good varieties of *Ampelopsis*.

The following species of *Vitis* are suitable for the verandah, pergola, arch, and wall, or for clothing tree stems. *Henryi* has white bands along the midrib and lateral veins of the leaves, and the young shoots and the backs of the leaves are of a purplish colour, while the autumn colouring is good and distinct. I have quite recently seen plants growing in shady positions, whose appearance seems to show that both the summer and autumn colouring may be even better under those conditions than in the full sunlight. *Vitis Coignettiae* and *Thunbergii* are two strong-growing, large-leaved vines, and both are very valuable plants for the pergola. Their autumn colouring varies, but is usually very brilliant. *Vitis armata* is one of the more recent introductions, and is a very beautiful species. *Vitis purpurea*, the Claret Vine, has dark-red leaves throughout the summer which become much brighter in the autumn. When seen with the sunlight shining through the leaves the effect is very striking.

Then, lastly, we have the shrubs with bright-coloured berries. No one is likely to overlook the Hollies, because they are always with us, and will always remain indispensable. So also will the Mountain Ash and the Pyracantha, even though the fondness of the birds for

their berries so sadly shortens their period of beauty. Birds do not appear to interfere so much with the orange-coloured berries of the newer *Pyracantha angustifolia.* Both this species and *Pyracantha Lalandei* may be planted against a wall, or grown as bushes, at least in the southern half of the country. Our native Hawthorn is beautiful in May and again in the early winter when its shoots are crowded with berries. The much larger-berried American thorns, *Crataegus coccinea,* and *C. Crus-galli,* the Cockspur Thorn, are very ornamental, and in recent years Professor Sargent has brought into notice many other fine thorns.

The Berberis family is rich in bright-berried plants, some of them old favourites, others new-comers, which, on account of their undoubted beauty, have come to stay. *Berberis Wilsonae* is one of the very best of them, its branches often being weighed down by masses of beautiful coral-red berries.

Our fine native shrubs, *Viburnum Lantana, V. Opulus,* and *Euonymus europaeus,* with their bright berries, attract our attention in the hedgerows and woods, and are worthy of a place in all gardens where room can be found for them. They are good wild garden shrubs. *Viburnum rhytidophyllum,* and *V. Henryi* are evergreen shrubs recently introduced from China. They have bright scarlet berries, and are great acquisitions. The orange-coloured berries of the Sea Buckthorn remain in beauty till midwinter.

The bright-coloured hips of the briars and roses also perform their part in adding colour to the garden in the winter, notably the fruits of the Penzance Sweet Briars, *Rosa rugosa,* and *R. Moyesii.* And, finally, we have those beautiful crab fruits, hybrids of the Siberian crab, which should find a place in all gardens, large or small.

Many other trees and shrubs that I have not mentioned are available for autumn and winter colour effects, especially among those recently introduced from China, but if the interest and attention of the owners of gardens should be directed towards the more free use of plants of this description for the embellishment of their gardens, the object of this lecture will have been achieved.

SOME HINTS ON THE MANURING OF GARDEN CROPS.

By H. E. P. Hodsoll, F.C.S., M.S.E.A.C.

[Read August 28, 1917; Mr. E. H. Jenkins in the Chair.]

Owing to the submarine menace the question of food production in this country has become one of which an entirely different view must now be taken. In the past, farming and the growth of food-stuffs generally have been left entirely to private enterprise and have received little, if indeed any, national attention. Successive Governments have consistently and persistently ignored the fact that the industry of producing food—and consequently wealth—from the soil, must of necessity be of the first national importance.

It has taken the grim spectre of starvation to wake us up to this fact, and in view not only of the national shortage of food-stuffs, but of the world shortage, which is likely to continue for some years, we are now faced with the urgent necessity of producing the maximum crops from our farms and gardens.

Every owner or occupier of a garden or an allotment is, or ought by this time to be, aware of this fact; he knows that the prices of all foods have risen enormously since those far-off days before the war, and he shrewdly suspects that it will be a long time before supplies and prices return to their pre-war level, if indeed they ever do so.

The point therefore that we have to consider is—Can this increased production be brought about, and if so by what means? Every student of horticulture knows that it can. We have only to visit a highly cultivated garden, or one of the district swhere the best intensive cultivation is practised, to be astounded at the amount of food and wealth that an acre of old England can produce. What, then, is the secret? Wherein lies the difference between these fertile areas and so much of the country which we see yielding poor crops of inferior quality?

The reply frequently given, that it is all a question of soil, is not true. Admittedly the man who has a good natural soil starts with an advantage; but most of the soil in this country is capable of producing good and profitable crops if only it were properly drained, cultivated, and manured.

These are the three essentials. This lecture is not now concerned with the first two, important though they are, but confines itself to the last, the question of manuring—that is to say, the *artificial* feeding of the crop, the supplementing of the plant foods that are already in the soil.

As the science of manuring progresses we realize that the inherent value of the soil is not of such prime importance as we originally thought, and we find that a poor soil may in a few years be improved out of all recognition, both in its texture and fertility, by judicious cultivation and manuring.

This can not only be done in private gardens where expense is of less object, but it can be done—and fortunately for the country is being done—commercially; that is to say, poor soils are being made to produce large crops, and at a good profit to the cultivator.

It is an undoubted fact that the use of manures is as yet but imperfectly understood in this country. In the first place, we as a nation do not use them in sufficient quantity. This fact is clearly demonstrated in an able and interesting paper recently issued by Professor Middleton, of the Board of Agriculture,* who compares very unfavourably the average produce of an acre of cultivated land in England, with that obtained by Germany and other Continental nations, and shows conclusively that the cause is largely the freer use of artificial manures in those countries.

This fault is one that is easily remedied, and already the best of our cultivators are aware of it, and are using far heavier dressings of fertilizers for their crops than they had been accustomed to apply.

There is, however, another and more serious fault, viz., the improper use to which the different classes of manures are put, arising from a lack of understanding of their ingredients, and of the action they are likely to have on the crop. They are frequently wasted, and even worse, for, as is to be explained later on, if the wrong manure is applied to a crop it may even do harm, and less result may be obtained than if nothing at all had been used. Correct manuring therefore means economy, and the obtaining of full value in increase of crop for the money spent on manures.

Unfortunately, most pamphlets and many books that have been published on this subject confine themselves to bald statements that such and such a fertilizer, or a mixture of two or three, is good for certain crops; no reason for the statement is given, so that the student never gets any further, and is just as much at sea with the next crop as he was with the first.

The object of this lecture is to show, that some system is necessary; a system by which the grower can reason the subject out for himself, and so ensure that the right quantity of the right manure is given at the right time.

The subject of the feeding of crops is a very large one, and touches on many sciences; it is not, however, proposed to go into detail, but to explain the system as briefly and as simply as possible.

* *The Recent Development of German Agriculture*, Wyman, Cd. 8305.

Governing Factors in the Choice of Manures.

In the first place, there are certain factors that govern the choice of manures, all of which must be carefully considered. They are four in number, viz. :—

1. The soil.
2. The crop.
3. The object for which it is grown.
4. The season and length of period of its growth.

The Soil.

All life and wealth spring from the soil. In it the plant grows, in it much of the food material on which the plant depends either exists or is placed, and from it the plant takes its nourishment. Therefore the soil is the grower's raw material, and by his management and manipulation of this raw material he produces the finished article —his crop.

In every other industry the manufacturer pays the most careful attention to his raw material; he knows that his finished article depends directly upon it; he therefore examines it continually, watches it carefully, analyses it, and make it his business to know exactly its composition, how it will behave under certain conditions, and what will be the result of various treatments.

How many growers make a real study of the soil they are cultivating? Do they know what it contains, of what it is deficient, and how it will respond when this or that manure is applied? And yet it is surely as important to their industry as to any other to have an accurate knowledge of the raw material on which they are dependent for their results.

Soils, as every cultivator knows, differ widely. This is easily understood if we look at their origin. They are formed mainly by the disintegration of the various rocks comprising the earth's surface. There are a great number of different rocks and formations in this country, as any geological map will show. These rocks have been formed and deposited under very varying conditions and at widely different periods; some under the influence of great heat, others of great cold, some were deposited under water, others have been transported by glaciers or rivers, some were formed many ages ago and some are of comparatively recent origin, so that it stands to reason that being formed under these varying conditions they must differ largely in composition.

The first duty, then, of the grower is to ascertain as well as he can something of the origin and composition of his soil.

This of course can best be done by analysis, but care must be taken in that case to get the analysis properly interpreted by a capable agricultural chemist. Failing an analysis he should certainly have

Results of Analysis—Various.

Total Phosphoric Acid.	Available Phosphoric Acid.	Total Potash.	Available Potash.	Free Lime as Carbonate.	Organic Matter.	Containing Nitrogen.	Equal to Ammonia.	Remarks.
Per cent. ·2 to ·3	Per cent. ·03 to ·04	Per cent. ·15 to ·3	Per cent. ·02 to ·03	Per cent. 2·0	Per cent. ·8 to ·10	Per cent. ·2 to ·4	Per cent. ·25 to ·48	Soil in high state of fertility.
·217	·016	·818	·008	·273	8·48	·275	·333	Hereford—sour, wanted draining, responds to lime.
·064	·012	·27	·008	·34	4·9	·129	·156	Hereford worked-out farm.
·051	·038	·262	·011	1·38	6·04	·164	·199	Worcester—responded to phosphates.
·064	·028	·378	·088	·69	6·88	·165	·136	Pershore ,, ,, ,,
·256	·031	·432	·007	·92	5·4	·161	·133	Tenbury—good fruit soil.
·153	·007	1·015	·02	·678	10·18	·206	·25	Worcester—old pasture.
·128	·015	·941	·026	45·77	17·56	·18	·218	North Kent—fruit soil.
·14	·017	·54	·032	·345	27·44	·736	·893	Romney—marsh soil.
·076	·02	1·196	·029	6·9	9·0	·157	·19	East Kent—good potato soil, won't grow fruit without phosphates.
·12	·004	·133	·04	·805	5·02	·19	·231	Average Guernsey soil.
·307	·004	·084	·029	1·86	4·7	·10	·121	Kent—trees stunted.
·192	·01	·212	·03	·48	6·3	·14	·169	Middlesex—club root.
·201	·032	·42	·027	2·68	9·35	·3	·364	,, good.
·34	·037	·40	·026	1·6	8·74	·22	·267	,, ,,

his soil tested for its lime content, as this is a most important factor. Simple tests for this are given in the pamphlet on the Cultivation and Manuring of the Kitchen Garden, published by the Society, and the whole question of the value of lime in horticulture is dealt with in vol. xlii. p. 236 of the JOURNAL of the Society.

In order to show the great variation of different soils in their contents of the essential ingredients, it is only necessary to glance at the table on p. 349, which is compiled from actual analyses of soils from different parts of the country. It will be noticed that they are all from districts where intensive cultivation is practised.

Having by this means, and by the practical observations of which all growers know the value, carefully studied his soil, the cultivator is armed with his first essential knowledge, viz., that of his raw material.

The relation of this knowledge to manuring is obvious. In the first place, deficiencies must be made good. Where lime is shown to be absent it should be added; if phosphates, ammonia, or potash, are deficient they must be supplied; where, on the other hand, any of them is present in sufficient quantities no more should be given, otherwise not only is the value of such application thrown away, but harm is done by upsetting the balance of the soil, which is of the utmost importance.

For the purpose of ascertaining whether any of these ingredients is present in the proper proportion in any given soil, reference should be made to the type analysis at the head of the table, which is that of an ideal well-balanced soil to which it will be safe to work.

The Crop.

The next point to which attention should be paid is the crop to be grown. This also, like the soil, requires careful study. The cultivator should watch the rooting and growing habits of his crop. If deep-rooted he will know that surface cultivation and manuring alone are no good. He must trench or subsoil for such crops, and dig in lasting manures of an organic nature that will not wash out of the soil. Good examples of such crops among those grown in the garden are parsnips, beet (especially the long variety), carrots, tomatos, and beans; and among farm crops wheat, mangolds, and beans. Shallow-rooted crops, on the other hand, such as peas, onions, lettuce, and most of the green crops in the garden, and oats, barley, and turnips on the farm, will require soluble or available top-dressings to force them on in the growing season, though these too must have sufficient nutriment under them to ensure a steady growth.

Another point to watch is whether the roots spread outwards or have a marked downward tendency. Fruit bushes and bush trees as a rule spread their roots outwards—they will generally reach as far from the stem underground as the branches do above ground—manures should therefore be distributed all over the soil under the

branches and not be thrown, as is often done, close to the stem. Strawberries, on the other hand, send their roots downwards and only slightly outwards: manures in this case should be applied either on the top of the plants (provided it has been previously ascertained that the particular manure used will not damage the foliage and crowns), or, better still, close round the plants. To sow soluble manures down the middle of the rows of strawberries is to waste the greater part of them, and yet they are often so applied.

All these points should be watched, the object of course being to place the manure where the roots are to be found, so that the plant may obtain full benefit from them.

Students of botany will find a study of the Natural Orders of distinct use to them in this connexion. We know that there is a similarity in flower, fruit, or habit of growth in members of the same Natural Order; and there is a similar affinity in what may be termed their feeding properties—that is, the manure they require. For instance, all Cruciferae require lime and phosphates, the Leguminosae lime and potash, Solanaceae potash, &c.; so that while the Natural Order must not be taken alone as a guide to manuring, it is nevertheless a help when considered in conjunction with the other governing factors.

A point that should always be borne in mind is that all stone fruit requires lime, this element being an essential ingredient in the composition of the stone. The failure of the immature fruit so prevalent at the time of stoning in cherries, plums, and grapes is frequently due to a lack of lime in the soil.

The Object for which the Crop is Grown.

This will be the next consideration, and it is of quite as much importance as those already dealt with, though it probably receives even less attention.

What we have to consider is, Are we growing any particular crop for flower, fruit, or seed; or are we growing it for the production of stem, wood, or leaf?

The correct manuring of a crop depends more closely on this than on anything, and yet many practical men are not even aware of the difference. The importance of it will be seen presently when we deal with the function of the different ingredients of manures; it is sufficient at present to emphasize that the manuring for fruit or seed is entirely different from that for the production of growth of either wood or leaf—in fact, they are distinctly antagonistic, and therefore if the wrong manures are used, not only are they wasted but they actually do harm by accentuating an unbalanced growth that should, by different manuring, have been checked and not encouraged. When a fruit tree is making too much leaf all leaf-producing manures must be withheld and only those calculated to produce fruit be given. This is comparatively simple, as will be seen later.

The Season and Length of Period of Growth.

This is the last of what we have termed the governing factors, and has a very marked bearing on the question. Everybody knows that in the warm spring weather plant growth is more vigorous than at any other time of the year, but, like so many other factors in nature, we are accustomed to take it for granted without ever asking why.

In order properly to understand the reason of the rapid spring-growth, it is necessary to have some knowledge of the action of soil bacteria. It is impossible in the scope of this lecture to deal with this fascinating study, but those interested should read the Masters Memorial Lectures given by Dr. Russell, and published in the JOURNAL of the Society, vol. xli. pp. 173, 188. It is sufficient for our purpose to say that these minute organisms render available for the plant the food materials present in the soil and those we add to it in the form of manures, and at the season of the year when all life, both above and below ground, is waking from its winter sleep, the bacteria are at the height of their activity. Their work is briefly to break down the complicated compounds of ammonia, &c., and present them to the plant in a form in which it can take them up and feed on them. It is obvious therefore that spring- and summer-planted crops will not require such special attention in the matter of manuring as those that have to go through the winter, when the bacteria are dormant and therefore not preparing fresh food for them.

No better instance could be given of this than spring-cabbage, which is planted in September to be ready for use in the early spring. The practical grower dresses his land well before planting out his cabbage, and thus provides food for them through the winter. Among agricultural crops wheat is a good example, and requires more manuring in available nitrogen, either in the form of dung or the remains of clover, stubble, &c., than is the case with the later-planted oats or barley.

Every farmer knows that in a cold spring his wheat is apt to turn yellow; this is because the low temperature checks the activity of the bacteria, and consequently the plant becomes temporarily nitrate-starved. To remedy the defect he will give a light dressing of nitrate of soda or sulphate of ammonia.

Similarly mangolds, beet, and parsnips require heavier manuring than turnips, because the latter are later-planted and therefore get fuller assistance from the bacteria.

Closely allied with this question of season is the length of the period of growth of the crop. It is obvious that a crop that is long on the ground, like cabbage, winter beans, parsnips, &c., among garden crops, and wheat and mangolds among farm crops, will require more lasting manures than those that are on the ground for only a short time.

These, then, are the four governing factors which it is imperative to consider carefully if anything approaching correct manuring is aimed at.

The Essential Ingredients of Manures.

In order to apply our conclusions we must next examine the effect on the plant and its growth of the three essential ingredients of manures, viz., nitrogen or ammonia, phosphates, and potash.

Nitrogen is naturally obtained from the decay of animal and vegetable matter in the soil, that is, from the excreta of animals and from previous life, either animal or vegetable. In cultivated soils the chief natural source besides dung is the decay of the residues from previous crops, *i.e.*, roots, stems, and leaves which are ploughed or dug in. Without nitrogen a soil would be absolutely sterile.

The function of nitrogen is to build up the vascular and woody tissue of the straw and stem and the parenchymatous tissue of the leaf, or, in other words, to promote growth of stem, branch, and leaf. Without nitrogen a plant cannot grow; with a sufficiency of it, it will grow vigorously, and if too much is given—especially in a quick-acting form—rapid, soft growth with long joints is produced. An excess of nitrogen tends to lessen fruiting and ripening, the energy of the plant being all turned towards growth.

Of the manures containing a preponderance of nitrogen, which may therefore be calculated to promote growth, the chief are dung, crushed hoof, dried blood, meat meals, fish meal, feathers, rabbit's flick, shoddy, &c., among organic or natural manures, and sulphate of ammonia, nitrate of lime and nitrate of soda among inorganic or chemical manures.

Phosphates are hardly less necessary than nitrogen, and from our present point of view perhaps the most important of the three, as they are present in the soil in very small quantities. Naturally they are derived from the disintegration of phosphate-bearing rocks, by which process phosphates of calcium, iron, aluminium, &c., are formed. Their function, roughly speaking, is the production of blossom and fruit. They induce a short-jointed, hard, and sturdy growth and promote early ripening, a growth and habit diametrically opposed to that encouraged by nitrogen. Phosphate has aptly been described as the bread-and-butter food of the plant, and in addition to its prime value as such it is essential to the well-being of the nitrifying bacteria on which, as already stated, we are so dependent. The chief phosphatic manures are those obtained from bone on the organic side, such as steamed bone meal, concentrated bone phosphate, bone meal, dissolved bone, &c., and basic slag, ground mineral phosphate, and super-phosphate among minerals.

Potash is of the three most naturally abundant, being an essential ingredient of most clays, in which it exists as a complicated compound of silica and alumina, but it is generally deficient in light soils.

Its functions are not so clearly defined as that of the other two, and is therefore more difficult to explain. It plays an important part in the formation of the starch, sugars, essential oils, and other ingredients that the plant stores up in its root, stem, or tubers and in

the fruit and seed. In all cases, therefore, where we grow a plant for the starch or sugar it lays up (as in the case of potatos, mangolds, and beet), or where quantity and size of fruit are required, we must see that the plant can obtain sufficient potash. It also tends to heighten the colour of both leaves and fruit, and is therefore particularly necessary in the case of apples and tomatos. Fruit and grain will not swell without potash; in fact, it works with phosphates in this function.

Although an element so widely distributed, the sources of commercial potash are very few, and before the war the world's supply was almost entirely in the hands of Germany, owing to the rich deposits of Stassfurt in that country, from which sulphate and muriate of potash and kainit are mined. Nitrate of potash is sometimes used, but, being a very powerful salt, care should be exercised in its application. Since the war British potash has been produced, and can now be obtained in a very suitable form for horticulture.

The great potash value of ashes from the garden bonfire should always be remembered.

These, briefly described, are the functions of the three essential ingredients of manures. It will be seen that they vary considerably, and while under normal conditions on a well-balanced soil all three work together and assist one another, it is impossible to take an intelligent view of manuring without some knowledge of the effect produced by each of them. Different crops require more or less of one or other of them, and under certain circumstances one or two may be very necessary while another may be distinctly harmful.

Forms in which they should be Applied.

Having decided what you require of nitrogen, phosphates, and potash, for the particular crop you are growing, the next consideration is the form in which you should apply them. There are many forms of each on the market, and, as the results of the application of these various forms differ, the amateur must not neglect this point.

His chief consideration will be whether he requires a lasting or a flushing effect; if the former, a slow-acting organic manure must be used; if the latter, a quick-acting mineral will best answer the purpose. For instance, in the case of the cabbage crop the grower will have decided rightly that nitrogen is required for leaf-production; he will therefore put dung or crushed hoof or some similar lasting nitrogenous manure under the crop to carry it through the winter, but will top-dress in the spring with nitrate of soda or sulphate of ammonia to get a quick early growth. Again, in manuring turnips superphosphate in the spring is a suitable dressing, but if phosphates are required for a fruit plantation, some form of bone phosphate (organic) should be used.

It is obvious that in his decision as to the form in which he had best apply his manure the grower will be largely influenced by whether

the dressing is to be given in the winter or spring. Broadly speaking, the lasting manures should be given in the winter and the quick-acting manures in the spring.

The chief consideration is whether the object is to raise the general fertility of your soil, as in the case of a fruit plantation, when winter manures will be given, or whether it is required to hurry on a particular crop, in which case a quick-acting spring dressing will best do the work. Such a case is the application of a soluble potash salt to potatos, nitrate of soda to cabbages and green stuff generally, soluble phosphates to tomatos, and the spring manuring of small fruit (especially black currants) to encourage the setting, holding, and swelling of the fruit, and, by keeping up the flow of sap and vigour generally, protecting them from damage by cold winds and frost.

It may be well to say that the idea that winter manures are largely wasted by being washed out of the soil is, roughly speaking, erroneous, if at least the right manures are used and properly applied. These organic slow-acting manures are not soluble until they are acted on by bacteria, and the bacteria are practically dormant in the winter, and only reach the height of their activity when the plant is also actively feeding. Therefore unless the manures are mechanically washed away, which can hardly happen if they are properly buried, the winter rains have little effect on them beyond a certain amount of disintegration, which is desirable.

Residues from Manures.

There is one other point in connexion with manuring which a grower will be well advised to consider, and that is the residues that are left behind from manures after the crop to which they have been employed has been harvested.

It is obvious that where there is perennial growth, as in the case of a fruit plantation, we want constantly to maintain a suitable well-balanced food. The growth and behaviour of the trees must therefore be carefully watched, and any tendency to excessive leaf production must be checked, by an increase of phosphates in the next dressing, &c.

In open land the important point is that the residue should suit the following crop, or be corrected to do so. A good illustration of how this is done by practical growers is the custom of applying a dressing of bones in some form to peas after cabbage. Peas require phosphates to build up their seed, and if these phosphates were not provided, the residues of the heavy nitrogenous dressings given to the previous cabbage crop would tend to produce too much haulm.

It may be well to mention here that many mineral manures, for instance superphosphate and sulphate of ammonia, leave behind an acid residue in the soil which should be counteracted by an application of lime. On the other hand, the residues of all the recognized

organic manures are beneficial in that they add the important ingredient of humus to the soil.

The above, then, are the points that the grower must consider if he is to arrive at a correct conclusion as to how he should manure any given crop. There are of course numerous minor points which it is impossible to deal with in this lecture, but the main considerations have been set out as briefly and simply as possible, having in view the magnitude and complexity of the subject.

The point which it is particularly desired to impress is that some such system as is herein set out is essential, and that it is futile to circulate a list of manures or mixture of manures for various different crops without giving the grower any reason for their adoption. Undoubtedly the correct and only way, if the ordinary grower, both professional and amateur, is to take an intelligent interest in the subject, which all the evidence shows he is willing and anxious to do, is to explain the action of the various ingredients of manures and to draw up some system on which the ordinary practical man may work.

This is the object of this lecture, which it is hoped to some extent, at all events, may be attained.

Illustrations.

For purposes of illustration let us now apply this system to a few of the crops most commonly grown.

As in these instances the soil is of necessity an unknown quantity, it must be assumed that it is in good balance and therefore in itself calls for no special treatment, though, as previously stated, this is a matter which the grower must first ascertain, and any deficiency discovered must be made good.

Cabbage.—This crop has already been frequently mentioned. It is grown essentially for its leaf, therefore nitrogen must be given. For the autumn-planted crop a lasting form must be given to carry it through the winter, therefore dung, crushed hoof, coarse meat meal or some other high-grade lasting nitrogenous manure must be used. The plant has a shallow-rooting habit, therefore the manure must not be buried too deep. For the quick growth necessary in the spring, available nitrogen must be given, such as nitrate of soda or sulphate of ammonia; some quick-acting manure containing phosphates, such as guano or a soluble organic phosphatic manure, may also be necessary in the spring to make them heart, but available nitrogen is the chief consideration.

Sprouts and Savoys.—For the same reasons available ammonia is essential for these, but owing to their growing season being in the summer they will not require such heavy dressings or such lasting manure as spring cabbage. More phosphates are necessary than in the case of cabbage to induce them to button and heart. They do well on meat meal, fish or meat and bone meal, and may be top-dressed

with guano or a soluble complete manure. If the growth is too slow, a light dressing of nitrate of soda or sulphate of ammonia will be found beneficial.

Cauliflower and Broccoli.—These require more phosphates than other green crops because they are grown for the flower. Some form of bone manure will be found most useful; on soils where it is suitable (notably those of a light or loamy nature rich in lime) superphosphate may be used. It is inadvisable to use superphosphate on heavy soils owing to its bad mechanical effect.

Peas, as has been stated, require phosphates because they are grown for the seed, and for the same reason, and seeing that they belong to the Order Leguminosae, potash also. The soil must not be deficient in lime. They require a little nitrogen to start the growth and to maintain the balance of vigour between the plant and the nodule-bacteria that live on their roots and obtain nitrogen from the air for their host plant. They are shallow rooted, and the manure must therefore not be put too deep.

Beans require similar treatment, but are grosser feeders and more deeply rooted. They grow more woody tissue and therefore require more nitrogen. Dung is frequently ploughed in for them with good results. They also grow well on meat meals.

Potatos have to make and store up a large quantity of starch in a comparatively short growing period, they therefore respond to potash and a quick-acting manure. They will do better on a soluble artificial manure than on dung, and pay for liberal treatment.

Tomatos must have phosphates to produce fruit, and potash to swell and colour it. They belong to the Order Solanaceae, which also indicates potash. Too much nitrogen will produce soft growth with a preponderance of leaf and stem.

Onions require nitrogen to give a vigorous growth, and potash to enable them to store the food quickly. They are very shallow-rooted, so top-dressings should be used. Soot will be found to be a good manure for this crop, especially on heavy soils; a high-grade meat meal or dried blood is also suitable.

Cereals.—All want phosphates for the formation of the grain. Winter wheat requires more nitrogen than the other cereals because it has to stand through the winter.

Fruit.—Plums, gooseberries, loganberries, and raspberries are gross feeders and will take more nitrogen than other fruit crops. Lasting manures should be used, such as dung and other nitrogenous organic manures. Plums and gooseberries respond excellently to crushed hoof or high-grade meat meal; a medium meat meal or fish being excellent dressings for loganberries and raspberries.

Apples, currants, and strawberries, on the other hand, must have phosphates; and a meat and bone meal, or bone manures of some sort, will generally give the best results.

In this way every crop may be dealt with, and if the considerations above set out are carefully weighed, a fairly correct estimate of what

is required in the way of manures may be come to, much disappointment avoided, and much money saved. In any case it is a far more satisfactory way of approaching the question than the haphazard method—or lack of method—at present commonly practised.

Quantities.—The question of the quantities of the various manures to be used has purposely been omitted, because it is desired to avoid giving any hard-and-fast rules. The correct quantity of any particular manure to apply will depend on the soil, the crop, the previous manuring, and various other factors; and this again is a matter that the grower should study for himself.

He is therefore advised to ascertain first from the seller of the manure the quantity advised, and then to inquire locally the quantity generally found to give the best results. He should then experiment for himself, and he will generally find that about half as much again as is generally advised and used is the most economical application. The only exception to this last statement is to be found in the few districts where intensive cultivation is really practised, such as Evesham, parts of Kent, Wisbech, &c., where manuring from a practical point of view is really understood.

Let the grower keep in mind that his object should be to feed the plant with all it wants at all periods of its growth, so as to promote regular, healthy, and continuous growth, leading on to the ultimate aim of the plant, namely, the formation of blossom and fruit. No check should be allowed; to every call the plant makes the soil should be able to respond; this is the ideal state of things, and the true science of manuring.

MONOGRAPHS FOR AN AMATEUR GARDENER'S LIBRARY.

By E. A. Bowles, M.A., F.E.S., F.L.S., V.M.H.

[Read November 6, 1917; Mr. G. Loder, F.L.S., in the Chair.]

[Note.—The books marked with an asterisk (*) in this paper may be consulted in the Lindley Library, at the R.H.S. Offices, Vincent Square, S.W.]

A good definition of a monograph is given in De Candolle and Sprengel's "Elementary Philosophy of Plants." "By a monograph we understand a complete account of any one family, tribe, or genus, nothing being neglected which is necessary for a perfect knowledge of it."

A more concise one is found in Dr. Daydon Jackson's "Glossary of Botanic Terms." * "A systematic account of a particular genus, order, or group."

Pritzel extended a wider use to the word, and in his index of botanical books and pamphlets, "Thesaurus Literaturae Botanicae," * classified as monographs works on single species or forms, and even on the medicinal use of a particular plant.

This practice increases the list to such a length that it would be impossible for us to deal with a tithe of those he mentions. However, many of these works are of too strictly botanical a nature to interest the ordinary amateur, many deal with cryptogams, and others have been superseded by later publications.

Yet, as many amateurs interest themselves in some special genus and are greatly helped by a knowledge of all the books bearing upon it, they would do well to consult the two-score pages Pritzel devotes to monographs, to find out what works have been published on their chosen branches of study.

I propose to select for notice a few of the monographs on the more popular orders or genera of plants, but to omit those on Orchids, Roses, Fruits and Vegetables, Chrysanthemums, Dahlias, and some other florists' flowers, the publications on which are so numerous that they deserve separate lectures by experts in each branch. Very nearly complete lists of such books are to be found in Mr. Harman Payne's useful "Florist's Bibliography" * (Wesley, Strand, London, 2nd ed. 1913).

The amateur who has chosen the genus *Iris* for his line of work is fortunate, not only because he will find several books to help him, but, if he can afford one that sells for six guineas, he may be guided and stimulated in his work by what to my idea is the model for all future monographs, Mr. W. R. Dykes' "The Genus Iris" * (Cambridge University Press, 1913).

I can only find two faults in it. It is so large, and it costs so much; but both of these are occasioned by its virtues. The life-sized portraits of Irises are very beautiful, and require every inch of its dimensions so as to avoid that sad example of defaced beauty, a folded plate. There are forty-six of these full-page coloured plates of representative or little-known species, besides two others showing various forms of seeds and roots.

If perfection were possible in a monograph, there should be a coloured figure of every species and variety of the plants described; but with such a genus as *Iris* this would mean several large volumes, and we must be grateful for the number of original plates in this, and also for the clear way in which attention is called to figures in other books. This is done by an asterisk preceding the references to descriptions in other works that are accompanied by a figure, both under the accepted name and also in the list of synonyms.

The ample margins, and the arrangement of lists of authors, synonyms, and localities in columns, make it wonderfully easy to find any required reference. The reader is further assisted by the use of the same sequence of parts of the plant in the description of each species, and the commencement of a fresh line for each heading. In many cases outline drawings are given in the text, showing the most important characters.

But the greatest value of the book is due to the fact stated in the introduction, that the writer "refused as far as possible to take anything for granted," and instead of being content to copy the statements of local floras, he determined to examine all the available herbarium specimens, and whenever possible to cultivate the plants himself. The book is therefore rich in original observations, useful to the systematic botanist and also to the cultivator of plants for the sake of their beauty—a rare combination in a book of such importance; for it is seldom that so clever a botanist and so ardent a gardener are combined in one personality to form so good an author.

He tells us, for instance, that the moisture-loving Irises, *Iris hexagona* and *I. fulva,* must be grown in hot and dry places to be induced to flower freely in England: that there are two distinct forms of *I. ruthenica,* of which one flowers well and the other is a very miser of its blooms.

Another of his discoveries is so useful and interesting that I quote his words: "Nature has provided us with one infallible sign which will show us whether an Iris is a native of a dry or a wet soil. This will be seen if leaves of *I. Pseudacorus* or *I. versicolor* are held up to the light side by side with a leaf of a Pogoniris; for instance, of *I. germanica.* The latter will appear of a uniform green, but the former will show a number of minute blackish spots, which on microscopical examination prove to be due to the fact that at these points the vertical channels in the tissue of the leaves are blocked by growths of apparently the same structure as that which surrounds the passages. The increased

thickness of the structure at these points produces the appearance of the black spots."

For those with more modest purses and ambitions there is the same author's little book "Irises" * in The Present-day Gardening Series, at 1s. 6*d.* (Messrs. Jack). It has eight excellent coloured plates from photographs of the actual flowers, and gives a very fair idea of the more important species suitable for cultivation, and, in chapter xv. on Irises that seldom flower, tells of those most people will wish to avoid.

Another very useful book is "The Book of the Iris," * by R. IRWIN LYNCH (vol. xxi. of John Lane's Handbooks of Practical Gardening, published in 1904, 2*s.* 6*d.*). Until the great monograph came, this was the chief guide for all Iris-growers.

The thirty-eight photographic illustrations are all good, but especially those taken purposely for the books by Mr. ALLARD, who was at that time on the staff of the Cambridge Botanic Garden. One feature of this book is a couple of pages and a plate describing the methods of making, and best forms of, zinc labels. I have followed the advice given therein ever since I read it, and, if only zinc were as easily obtained as formerly, I should use no other kind of labels for outdoor work.

Mr. EWBANK wrote a chapter on the cultivation of Oncocyclus Irises specially for this book, and as he succeeded in growing these, the despair of most other Iris lovers, his advice is worth pondering. Even the possessor of the great monograph, should he wish to grow Irises well, cannot afford to be without Mr. LYNCH's book, nor should he fail to acquire one of the few remaining copies of the reprint from the R.H.S. JOURNAL of Sir MICHAEL FOSTER'S "Bulbous Irises" * (1*s.* 6*d.*, post free 1*s.* 10*d.*), published in 1892-3. The substance of it was given as a lecture, and afterwards, expanded and slightly altered, appeared as this little book, which, as far as it goes, is a masterly and pleasantly written monograph of this group.

Then the serious botanist must have Mr. J. G. BAKER'S "Handbook of the Irideae" * (London, 1892), and so too should the intelligent amateur, for the genera *Moraea, Marica, Sisyrinchium, Gladiolus, Crocus,* and others are dealt with, as well as *Iris* itself.

It is the last of a series of botanical handbooks prepared by Mr. BAKER while he was at Kew. They represent many years' work, and stand as a marvellous record of his great services to Botany.

In many of the families dealt with, he evolved order out of chaos, being the first to collect together in a systematic work the references to published descriptions of each species. Further, his position at Kew, and his knowledge of the British Herbaria and those of the Continent, enabled him to describe for the first time great numbers of plants. The first of the series was the "Handbook of the Fern Allies" * (Bell, London, 1887). Then came the "Amaryllideae" * in 1888, the result of twenty-three years of work in making careful notes on all the specimens

of this Order that passed through his hands in a living state, as well as work among dried specimens. This volume is of importance to most gardeners with a desire to study carefully the families of *Narcissus, Galanthus, Zephyranthus, Sternbergia, Hippeastrum, Nerine, Alstroemeria, Crinum, Agave,* and their allies.

"The Handbook of the Bromeliaceae" * followed in 1889. It is of less interest to the ordinary amateur, as so few of the genera of this Order provide hardy plants. *Dyckia, Rhodostachys,* and *Billbergia* furnish a species or two worth trying in sheltered corners, but *Ananas, Tillandsia, Pitcairnia* and such require indoor treatment and are not in fashion in these days.

The "Liliaceae" * was only published as separate papers in the Journal of the Linnean Society, extending from the eleventh to the eighteenth volume, 1870 to 1880. These eight papers, if collected, make a very fairly complete monograph of the Order; but, as the author has stated in his preface to the Irideae, he has not included the genera *Smilax* and *Allium,* which had been so thoroughly monographed already by M. Alphonse de Candolle and Dr. Von Regel.

Thus Baker's monograph contains:

1. The Gamopetalous genera—*Hemerocallis, Kniphofia, Agapanthus, Brodiaea, Hyacinthus, Lachenalia, Chionodoxa,* &c.
2. Scilleae and Chlorogaleae.
3. Tulipeae, containing *Lilium, Tulipa, Fritillaria,* &c.
4. Asparagaceae, with *Dracaena, Convallaria, Clintonia, Ruscus,* &c.
5. Anthericeae and Eriospermae, *Asphodelus, Eremurus,* &c.
6. Hypoxidaceae.
7. Colchicaceae.
8. Aloineae and Yuccoideae.

Unfortunately there is no separate index to them, yet they are a very useful set of papers when once the user has found his way about in them.

It may be useful to notice now some separate monographs on genera included in these Orders.

In the Irideae there is "The Genus Crocus," * by George Maw (Dulau, 1886, £7). It is as nearly perfect as a monograph can be. Every then known species is figured in colour, though many had to be drawn from herbarium specimens. Maw spent ten years preparing this book, and travelled in Greece, Asia Minor, Italy, Spain, and the Levant in search of Croci in their native homes, and corresponded with consuls in many distant places to get others. He cultivated all those he could collect, and drew all the plates, when possible, from living specimens. The tables of specific characters, maps, and chapters on geographical distribution, literature of the genus, and the history and use of Saffron, make the work as complete as possible.

The plates seem to have been drawn and shaded in pencil and then coloured, and therefore the colouring is rather subdued. The outline, however, is wonderfully good, especially in the many dissected

portions, the seed sections of leaf, portions of corm tunic, &c. If there is a fault to be found, it lies in the overcrowding of the plates with these detached portions. It would have been better to have kept them to separate plates, leaving the portraits of each complete plant with a clear margin.

Good as these portraits are, they do not flatter the plants except in two cases, *Crocus ochroleucus* and *C. Malyi*. It may be that MAW had finer forms of these two than are now in cultivation. Certainly I have never seen either species as large or handsome as in those plates.

There have been earlier accounts of the Crocus, and I think very highly of Dean HERBERT'S " A History of the Species of Crocus," * published after his death in vol. ii. part iv. of the JOURNAL of the Horticultural Society of London in 1847.

JOSEPH SABINE'S paper * on Crocuses grown in the garden of the Horticultural Society, read in 1829, and published in vol. vii. of the TRANSACTIONS of the Horticultural Society, London, in 1830, is interesting, as he describes well many garden varieties of *C. aureus, C. vernus, C. versicolor*, and *C. biflorus*, some of which have been lost sight of since his day.

JOHN FERDINAND HERTODT'S " Crocologia," published at Jena, 1671, is a very curious book. Twenty-six forms of *Crocus* are described in the language of the period and are not easy to recognize. The main portion of this work of 283 pages is devoted to the uses in medicine of Saffron. According to HERTODT, it is the panacea for all ills, from hypochondria to toothache, taking arthritis and the plague on the way. It will cure madness and dye the hair yellow. Asthma and cataract fled before it. Of course, you must mix certain other things with it, and long prescriptions are given, including such potent drugs as opium, myrrh, henbane, and aloes. Certain maladies require the worm-eaten wood of oaks, earth-worms dried and powdered, fat of mountain mice or pounded swallows' nests. But in every prescription Saffron appears as the all-important ingredient.

In the Order Liliaceae many families have been well monographed. At the head stands " A Monograph of the Genus Lilium," * by H. J. ELWES (1880, 10 guineas), a large folio, with forty-eight coloured plates drawn by FITCH. They are fine plates, bold in outline, and in some there is much play of light and shade; yet I do not like them. The artist has a way of making a flower look artificial, as though made of painted calico and not of living sap-filled cells. I think it is due to the abrupt edges of the markings and masses of shade. As instances I call attention to the crimson horseshoes or pitchforks at the bases of the segments in *Lilium monadelphum*. They are so hard and sharp that they appear to have nothing to do with the flower. Or, again, the spots of *L. Humboldtii*. In my copy some of the yellow, white, and red paints have turned black. This is a pity, for the text is so authoritative and complete in information up to the date of publication that it is worthy of better-coloured plates.

In the absence of an index, except to the plates, and the pages and plates being unnumbered, it is difficult to refer to. I hear rumours of a supplement bringing the family up to date, and that Mr. GROVE is helping with it. We have a foretaste of his powers in his small book "Lilies" * (vol. viii. of The Present-day Gardening Series, published by Messrs. Jack), a charming book full of good advice and useful hints —as it should be, seeing that the writer knows and grows Lilies better than anyone. In the preface Mr. ELWES testifies to his success in these words: "I can say with truth, that neither the late Max Leichtlin nor Mr. G. F. Wilson, the two great Lily-growers of the past, knew as much about the cultivation of Lilies as he does."

The eight plates from coloured photographs are excellent, considering their size. The Lilies are usefully divided into those easy and those more difficult to manage, and the addition of a list of those not yet in cultivation completes the account.

"The Book of the Lily," * by W. GOLDRING (vol. xvii. Handbooks of Practical Gardening, London, 1905, John Lane, 2*s.* 6*d.*), is a handy, inexpensive guide to Lily-growing. The eighteen photographs of the illustrations are not very good, poor specimens or very small groupings having been used for most of the subjects. The chapters on planting and propagating Lilies are especially practical and useful.

Miss JEKYLL has written a charming book, "Lilies for English Gardens: a Guide for Amateurs" * (The "Country Life" Library, 1901, 8*s.* 6*d.*). Like all of her books, this contains a wealth of beautiful photographs, showing fine groupings and garden effects of well-planted Lilies, blossoms or cut flowers, and the flowers only of many species. Several of these last are from drawings. It is just the book that makes the reader wish to grow the plants it tells of, and suggests to his mind possible ways of grouping them in his garden.

"Notes on Lilies and their Culture," * by Dr. WALLACE (2nd ed. 1879, Colchester, 5*s.*), contains a great deal of information, both original and collected. One especially useful chapter is the eighth, on Lily Bulbs, from F. W. BURBIDGE's paper in "The Garden," * vol. xi., revised by Dr. WALLACE. The excellent illustrations are from BURBIDGE's drawings. The systematic arrangement and notes on species are mainly taken from Mr. BAKER's synopsis in the *Gardeners' Chronicle*, 1875.*

There is no need to mention books on Tulips, as Mr. JOSEPH JACOB has so lately given us such a complete and excellent bibliography. It is arranged according to the dates of publication and occupies twenty-two pages, and forms chapter viii. of the "Report of the Tulip Nomenclature Committee," * 1914–15, recently published by the R.H.S., price 2*s.* 6*d.*

One of REDOUTÉ's greatest works is entitled "Les Liliacées," * but is not strictly confined to plants belonging to that order as we now classify them, and many Irises, Sisyrinchiums, and Crocuses are included, as well as Amaryllids, such as *Crinum, Narcissus, Nerine,*

and the Snowdrop. Cannas, Musas, an Orchid or two, Commelinas, *Alisma*, and the Pineapple are instances of plants from Natural Orders other than the Liliaceae.

It is, anyway, a magnificent book, one of the finest ever produced, and one of my most precious possessions is a very fine set of its eight volumes, with the plates in two states: in plain black on buff paper; and also the coloured print, retouched by hand.

There is some mystery as to the exact history, date, and number of the issues of this book.

The first issue appeared during the years 1802–1816, and was sold in "livraisons" containing six plates each, at 40 francs—eighty such parts completing the work.

Later REDOUTÉ started a second style of issue, and explains its aim and character in a preface in these words:

"Je ne m'étais d'abord flatté que de l'espérance de conserver avec le plus de soin possible les seules couleurs dont la gravure nous permit alors de faire usage. Instruit par l'expérience, je publie une seconde édition peu nombreuse, mais aussi parfaite que l'art me semble pouvoir la produire, comme le résultat de tous mes efforts pour représenter encore plus fidèlement les belles fleurs de la plus riche famille des plantes. Pour attendre ce but j'ai perfectionné les moyens employés par la gravure; j'ai composé les couleurs avec un meilleur choix, et j'ai ajouté moi-même, avec le pinceau, les délicatesses de nuances que lui seul sait bien rendre dans toute leur fraîcheur: † j'ai joint à tous ces perfectionnements celui de marges plus spacieuses, qui permettront aux tiges de se déployer avec plus de grâce et de liberté.

"Quoiqu'il soit vrai de dire que cette édition ne soit pas un autre ouvrage et qu'elle ne diffère pas essentiellement de celle que le public a daigné accueillir avec bonté, l'on ne peut dissimuler cependant que les quarante exemplaires que j'annonce ne soient bien plus parfaits, bien plus précieux pour les amateurs d'une science enrichie tous les jours par l'étude de Botanistes justement célèbres. Si j'ai le bonheur d'obtenir les suffrages des uns et des autres, mes travaux, qui n'ont pas été sans peines, ne resteront pas sans quelque gloire."

It would appear that he did not obtain the support he hoped for, as in the superb copy belonging to the Lindley Library there is a pencil note in the margin "Dix-huit seulement. REDOUTÉ."

These two issues apparently ran concurrently when once the major examples began to appear. REDOUTÉ was only the artist who provided the plates, the text of his great works being written by various French botanists of the period.

That of the first four volumes of his Liliacées, as stated by PRITZEL, was written by AUGUSTIN PYRAMUS DE CANDOLLE; vols. v.–vi., by FRANÇOIS DE LA ROCHER; and vii.–viii., by ALIRE RAFFENEAU-DELILE. His plates are so wonderfully beautiful that his name is the one remembered. He was the inventor of the process of colour-printing

† L'on conçoit qu'il serait impossible de faire ces retouches au pinceau pour une édition nombreuse.

that he used, and alludes to it in the *avant-propos* of his book, "Les Roses." *

"Le procédé que nous avons inventé en 1795, pour imprimer les planches en couleur, n'a aucun rapport avec celui que Bulliard a mis en usage dans son ouvrage des *Champignons*. Le sien, qui n'était qu'une imitation de la manière de Leblon, consistait dans l'emploi des couleurs, *sur plusieurs planches*, pour l'impression de chacun de ses sujets.

"Le nôtre, au contraire, consiste dans l'emploi de ces mêmes couleurs, *sur une seule planche*, par des moyens qui nous sont particuliers, et que nous nous proposons de publier un jour. C'est ainsi que nous sommes parvenues à donner à nos gravures tout le moelleux et tout le brillant de *l'aquarelle*, comme on peut le voir dans nos *Plantes Grasses*, dans nos *Liliacées*, et dans nos autres ouvrages."

Whatever the method was, no pains were spared to make the impression perfect. I have been told that the plates were washed and repainted in the natural colours after each impression. This produced a stipple engraving, and if a powerful lens is used to examine a portion of one of these, it is astonishing to note what a vast number of minute dots are required to form the outline of an anther or even a tooth at the edge of a leaf. Then a wash of colour was applied by hand to certain portions and some of the shadows were strengthened. He was such a master of light and shade that no other flower-artist has surpassed him in representing the natural pose of his subjects and making them stand out with such an idea of relief.

Allium is so well monographed by Dr. REGEL that BAKER, as I have already stated, did not think it necessary to include the genus in his monograph of the Liliaceae. It is dealt with by REGEL in two works, "Alliorum adhuc cognitorum monographia" (Petropolis, 1875), and "Allii species Asiae centralis" (Petropoli, 1887). They are strictly botanical works, chiefly in Latin, with notes in German, and were published in "Acta Horti Petropolitani," * vols. iii. and x.

Another book from Petrograd is "Eremurus: Kritische uebersicht des Gattung," by Mme. OLGA FEDTSCENKO (1909, 6*s*. 6*d*.), a large quarto with twenty-four plates, and a most careful piece of work. The references to published notes given under the heading "Literatur," after the Latin diagnosis of the species, are wonderfully complete. The plates are from outline pen-and-ink drawings showing various portions of the plant, treated from a botanical and not an artistic point of view, and are excellent for their destined purpose.

The Yuccas are splendidly monographed in "The Yucceae," * by WILLIAM TRELEASE, in the Thirteenth Report of the Missouri Botanical Garden (1902). It is a fascinating paper, clear and authoritative, replete with references to earlier works, figures, and localities, and beautifully illustrated with eighty-seven photographs, many of which present the plants growing in their native surroundings. Others show seedpods, seeds, and seedlings, and others a few flowers separated from the spike.

In 1907 he issued "Additions to the Genus Yucca" * in the Eighteenth Annual Report, Mo. Bot. Gard., chronicling some further notes on species already dealt with and on two new and undescribed species, *Yucca decipiens* and *Y. Endlichiana.*

The latest work on this genus is "Le Yucche," by G. MOLON, Milan (1914, fr. 6.50, 12mo). It is but a small manual, but contains eight coloured and fifty-three black-and-white figures. It chiefly presents us with TRELEASE'S work in a shortened form, and in Italian. Many of the illustrations are reproductions of his plates. Its value lies in a key to the species based on the nature of the stems and leaves. This, as the author states, is of more service in Europe, where, except *Yucca aloifolia*, the plants do not bear fruit; TRELEASE'S key being based on the differences of the fruit-vessels for its main divisions.

Also, Dr. MOLON gives every known specific name and synonym in alphabetical order, and includes the numerous garden hybrids raised by SPRENGEL at Naples. These last form the subjects of the coloured figures and a few of the photographic ones.

Compared with Liliaceae, few genera of the Amaryllideae have been well monographed. As already stated, many have fine portraits in REDOUTÉ'S great work.

Dean HERBERT, who made a special study of bulbous plants, has left, as the chief monument of his labours, a book that is of great interest to any studying this Order, viz., "Amaryllidaceae" * (London, 1837, 8vo, with plain plates, £2; with coloured plates, about £3 10*s*.). It is mainly a botanical work, but full of cultural hints, for he grew and watched with a keen eye a great number of rare plants. The plates have no artistic value, and for the most part represent only portions of flowers or leaves. Those drawn from herbarium specimens are coloured in the faded hues of the dried flower before him.

Of separate genera, *Narcissus* has received most attention. The most serious attempt at a monograph is "The Narcissus," * by F. W. BURBIDGE and J. G. BAKER (L. Reeve, London, 1875, 8vo, £1 10*s*.). The main portion consists of a review of the genus by BAKER, published in the *Gardeners' Chronicle* in 1869, revised and brought up to date by the author for this book. The late Mr. BURBIDGE contributed introductory chapters on the history, cultivation, diseases, and species and varieties, of Narcissus. Those who knew him, or who recognize the charm and interest of his writings, will feel this work is full of his personality. His knowledge of the old English books on plants makes his notes on the varieties very valuable.

He also contributed forty-eight coloured plates, which are better if judged from a botanical than an artistic standard. His outlines and dissections are very good, but his method of shading was crude and heavy, and the reproduction as to colouring is very poor, a smudgy hand-colouring on lithographed plates; the green tints being suggestive of juvenile efforts.

A smaller and more up-to-date book is "The Book of the Daffodil,"* by the Rev. EUGENE BOURNE, vol. xvi. of Handbooks of Practical

Gardening (published by John Lane, 1903). It is full of useful information from cover to cover. The chapters on How to form a Collection, Certificated and other fine varieties, as well as those on cultivation, are particularly good. The photographic illustrations are excellent.

Then Mr. JACOB has written the Daffodil volume of The Present-day Gardening Series.* It is a brightly written book, full of interesting chapters, such as The Daffodil in Books, History, Raising new Varieties, The R.H.S. Classification, Lists for different purposes, and a Calendar of Operations. The eight coloured plates in this volume are, I think, the best in any of this well-illustrated series of books.

The fullest account of the Snowdrops is to be found in a monographic sketch of the genus Galanthus, by Dr. GÜNTHER RITTER BECK V. MANNAGETTA, in the *Illustrirte Garten-Zeitung*,* February 1894, Vienna; but unfortunately it is unobtainable and also in German. It is a careful piece of work and brings together a mass of references.

In English the best is BURBIDGE'S paper read before the Royal Horticultural Society, March 10, 1891, and published in vol. xiii. part ii. of the JOURNAL. He gives a capital alphabetical list of the then known varieties. The late Mr. ALLEN'S and Mr. MELVILLE'S papers in the same volume also provide useful facts.

The *Clematis* is the subject of five works, three of which call for notice. The oldest is "The Clematis as a Garden Flower," * by THOMAS MOORE and GEORGE JACKMAN, published at the Woking Nursery, 1872, and a new and revised edition in 1877, with two coloured and fifteen black-and-white plates, many of which are by W. G. SMITH.

It is a trifle old-fashioned by now, both in style of illustration and subject-matter, but the descriptive notes on species and varieties are still very useful. A new and up-to-date edition with photographs of all the varieties would make a good book.

Of course, a great deal is said about the beauty and uses of *Clematis Jackmannii*, and rightly so, for it is not easy to overpraise this grand plant. It is interesting to notice that the author declares it to be a seedling, the female parent being a Viticella type.

The next writer, M. ALPHONSE LAVALLÉE, declares this plant is none other than a Japanese species, *C. hakonensis*, and much has been written on these different views. Anyway, "Les Clématites à grandes fleurs" * is a good book. Its title tells us it is a "Description et Iconographie des espèces cultivées dans l'Arboretum de Segrez." It was published in Paris in 1884 as a 4to, and contains twenty-four beautiful plates drawn from life and lithographed by Mlle. BERGERON.

There are charming reproductions of very clever pencil drawings. It is difficult to make an artistic plate out of one flower 6 inches across on a quarto page, and these drawings are worth studying by anyone anxious to succeed in this line. The smaller-flowered forms are beautifully treated, especially in the foreshortening of the fully shaded flowers and the delicacy of outline of the more lightly treated leaves.

The dissected portions, and especially the seed heads, are most admirable work.

The text is the result of much careful research and a knowledge of the living plants, and treats the Clematis purely from a botanical and classificatory point of view.

Mr. ROBINSON, on the contrary, has given us the horticultural side in his beautiful little book, "The Virgin's Bower: Clematis, climbing kinds and their culture at Gravetye Manor" (London, 1912). As with all his books, it is a pleasure only to touch the fine paper before enjoying the clear print. Three beautiful reproductions of photographs make one long for more. The kinds dealt with are arranged more or less in alphabetical order of their specific names. Some rather weird English names are provided, as, for instance, the Hairbell Virgin's Bower for *Clematis campaniflora*, where Bell-flowered would have been a translation of the Latin; and I prefer Nicholson's translation of Vine Bower for Viticella to the pre-Linnæan sentence, Virgin's Bower of the South of Europe.

The book is a pleasant record of the successes the Clematis family have achieved at Gravetye.

The year 1916 brought two important works on Japanese Cherries. One is E. H. WILSON'S "The Cherries of Japan" (Publications of the Arnold Arboretum, No. 7). It is the result of special investigations carried out during the Arnold Arboretum Expedition to Japan in 1914, and deals with ten species, three of which produce most of the large-flowered forms of our gardens. *Cerasus pendula*, the well-known weeping Cherry, and the winter-flowering tree known as *Miqueliana* and *microlepis* are stated to be varieties of *Prunus subhirtella*. The eight half-tone reproductions of photographs of specimen trees show what grand subjects for our gardens these would be could we only obtain them on their own roots.

The second book is vol. xxxiv. art. i. of Journal of the College of Science, Imperial University of Tokyo, "Japanische Bergkirschen, ihre Wildformen und Kulturrassen," by M. MIYOSHI, published in Tokyo. The text is in German, and to me its charm and value lie in the twenty-one plates at the end, four of which are photographic representations of fine specimen trees, one an outline drawing of *Prunus mutabilis*, and the others coloured figures of a great number of varieties, chiefly of *P. mutabilis* and *P. serrulata*. WILSON has lately written a supplement to his work, altering some of the nomenclature, as Miyoshi's work just antedated his.

Those who wish to study the Geraniaceae have a wealth of literature to guide them. First, there is "Geraniologia," * by CHARLES LOUIS L'HÉRITIER (Paris, 1787–88), a large folio containing forty-four copperplate engravings of Erodiums, Pelargoniums, Geraniums, and Monsonias. They are by different artists, but thirty-two are by P. J. REDOUTÉ, and beautiful examples of his skill. The delicacy of his treatment of the finely cut leaves of *Erodium supracanum* is well worth studying. The nearer leaves stand out in a wonderful

way, being almost black, so close and heavy are the lines. The leaves farthest away have no outline, and the lines that shade them are so fine that they appear as the softest possible grey, and the whole effect is a wonderful piece of perspective.

Other plates are by JAMES SOWERBY, PERNOTIN and others, and all of them beautiful; but it is easy to see at a glance which are REDOUTÉ'S.

The text for this work was never published, and, according to PRITZEL, the manuscript was in the Candollean Library, and some pages containing descriptions of twenty-six species of Erodium were in the Banksian Library.

Whoever has a copy of ANDREWS' "Geraniums" possesses another beautiful book. The title runs "Geraniums, or a monograph of the Genus Geranium, containing coloured figures of all the known species and numerous beautiful varieties, drawn, engraved, described and coloured from the living plants," * by H. C. ANDREWS, 1805, two volumes, 4to. There should be 124 of these brilliantly coloured plates, but complete copies are very scarce, and fetch £25 and upwards.

Almost all the plants described and figured are Pelargoniums, though all are named Geranium.

In SWEET'S "Geraniaceae" we find 500 of the most beautiful hand-coloured, copperplate engravings ever issued. There are five 8vo volumes, published 1820–1830, entitled "Geraniaceae: the Natural Order of Gerania," * by ROBERT SWEET, F.L.S. The delicacy of the drawing is delightful, the minute hairs on stems and leaves and the silky down of the seed vessels are marvels of skill and patience. This may be well examined in T. 34, *Pelargonium coriandrifolium.* Many of the plants figured are hybrids raised under cultivation, or, as SWEET calls them on the title-page, "beautiful mule-varieties cultivated in the Gardens of Great Britain."

Lastly, bringing together the earlier work, there is a monograph of the whole family by R. KNUTH (Part 129 of vol. iv. of ENGLER'S "Das Pflanzenreich," * published Leipzig, 1912, 32 Mk.). It is another instance of the patient labour of German scientists, and wonderfully correct and complete as to references to descriptions and figures. It is a purely botanical work, and although indispensable to anyone seriously studying any of the genera of the family, not otherwise a book that the ordinary amateur gardener would enjoy.

I have always considered the genera *Geranium* and *Erodium* particularly beautiful and useful for English gardens, and believe much might be done in crossing and selecting good seedlings among certain of the species, and I recommend this branch of gardening to amateurs who wish to work among a family of plants easily grown in the open air. A year or two of work with the living plants will teach the keen-eyed amateur that even German scientists do not know everything, and that careful collection of facts in books and herbaria do not furnish all that is needful to make a good monograph.

The "Pflanzenreich," however, is the most important series of

botanical monographs published in the present century; and though, with two exceptions, the sixty-one parts so far issued are in German, with Latin diagnoses and critical notes, certain parts dealing with plants important for gardens are of great service to amateurs interested in those families.

The great value of these lies in the excellent keys, not only to the genera, but to the sections of large genera and the species of each section, and the mass of references to literature and geographical distribution.

There are a few outline figures in the text which are good in representing dissections, so good and so few as to make one wish for more.

In times of peace it was easy to purchase the various parts separately, if desired; and, in the hope that it may be possible again before very long, I give a list of the more interesting families included in those published already:

Part 10. Tropaeolaceae. By Fr. Buchenau.
,, 14. Cistaceae. By W. Grosser.
,, 17. Lythraceae. By E. Koehne.
,, 22. Primulaceae. By Pax and Knuth, 1905.
,, 26. Droseraceae. By L. Diels.
,, 27. Polemoniaceae. By A. Brand.
,, 28. Scrophulariaceae, Antirrhinum and Calceolaria. By F. Kränzlin.
,, 33. Liliaceae, containing Asphodelus, Aloe, Kniphofia, Gasteria, Haworthia. By A. Berger.
,, 34. Sarraceniaceae. } By T. M. MacFarlane, and in English.
,, 36. Nepenthaceae. }
,, 40. Papaveraceae. F. Fedde.
,, 53. Geraniaceae. R. Knuth, 1912.
,, 61. Umbelliferae, Saniculoideae, containing Eryngium and Astrantia. Hermann Wolff, 1913.

THE ACTION OF ONE CROP ON ANOTHER.

By SPENCER PICKERING, F.R.S.

[Read before the Scientific Committee, Feb. 26, 1918.]

THE problems connected with the action of one crop on another have been engaging our attention at the Woburn Experimental Fruit Farm for over twenty years, and it is, naturally, impossible in a short article to give more than a very imperfect outline of all the experiments made on the subject.

The work originated in observing the great effect which grass had on fruit trees, and the conclusion drawn almost from the outset was that this effect must be due to some toxic action. But it will be well, in the first instance, to disarm criticism on two points: there can be no question but that the extent of the effect of grass on trees varies very greatly under different conditions—the nature of the soil, the nature of the trees, and probably the meteorological conditions, and all the facts which have been ascertained about the action, render such variations inevitable: indeed, it is quite possible that in some cases the prejudicial action of grass might be nil, though (with the exception of a partial instance, to be mentioned below) no such case has come under our observation: in various instances where there has apparently been no action, the results, on examination, have been lacking in some, or all, of the elements of precision which would justify conclusions being drawn from them. The second point is that toxic action does not necessarily involve the idea of any poison being exuded from the roots: such exudation may occur, but there is nothing as yet to prove it; plant-growth, however, is accompanied by the formation of much detritus: this accumulates in the soil, being there decomposed by chemical and bacterial agency, and eventually, as we know, enriches the soil; but it must pass through many phases before this point is reached, and some of the intermediate products of its decomposition appear to be harmful to vegetation.

That the baleful effect of grass on trees at our farm is very great, there can be no question. Fig. 54 shows results of grass having been sown round some standard apples immediately after they had been planted, the photograph having been taken three years later: and fig. 55 illustrates a similar result with dwarf apples. It was not expected that such an effect would be produced on trees after they had become well established in the ground, but the effect was, as a matter of fact, found to be just as great; the trees then grassed over had been growing for four years in tilled ground, but as soon as the grass grew,

Grass. No grass.

FIG. 54.—EFFECT OF GRASS ON STANDARD APPLE TREES THREE YEARS AFTER PLANTING.

[To face p. 372.

Grass. No grass.

FIG 55.—EFFECT OF GRASS ON DWARF APPLES THREE YEARS AFTER PLANTING.

Festuca in trays. No festuca in trays.

FESTUCA PRATENSIS.

Without grass in trays. With grass in trays.

TOBACCO.

Without clover in trays. With clover in trays.

TOBACCO.

FIG. 56.

Unperforated trays. Perforated trays.

Fig. 57.

[To face p. 373.

all growth practically ceased, and in the case of the weaker varieties, such as Cox, the trees were actually killed within two or three years. A similar result was obtained when the laying down to grass was postponed till thirteen years after the trees had been planted : the plantations in this case contained trees of sundry varieties of apples and pears, grown both as standards and dwarfs, and, whilst the different varieties showed great differences as to the extent to which they were affected, the general results may be gathered from the fact that the value of the crops from the grassed section was, during the four succeeding years, only 41 per cent. of that from the sections which had remained ungrassed, and, as in the previous case, some of the trees were actually killed. Yet another experiment was made on a plantation of standard trees of Bramley's Seedling after they had been established for twenty-two years, being then remarkably fine specimens of this variety. The grass did not come up well, but, in spite of this, the trees in the grassed section showed the effect even in the early part of the summer of the first year, by a marked difference in the appearance of the foliage, clearly visible from a considerable distance, whilst, later in the season, the effect was still more apparent by the grassed trees losing their leaves two or three weeks earlier than the ungrassed ones. The crops, also, were found to have been adversely affected by the grass.

Thus, the deleterious effect of grass in our soil is independent of the age of the trees when the grassing over is effected.

The peculiar effect of grass on the colour of the foliage is paralleled by its effect on the colour of the bark and the fruit : this effect is distinctive, and, being unlike that produced by lack of water or nourishment, suggested from the first some toxic influence. As regards the fruit, a lack of colouring matter is evident in the case of some varieties, but in others the change consists of an alteration in the colour, the green giving place to a red pigment. Such a change may be beneficial from the point of view of the grower, and, provided the action is not excessive, grass may also benefit the grower by causing increased cropping ; for, as is well known, limited injury to the tree often results in increased productiveness. What is best for the tree is not always best for the grower.

The injury to the tree affected by grass is not confined to the case of apple trees : precisely similar results have been obtained with every kind of tree investigated : pears, plums, cherries, oak, beech, ash, spruce, larch and fir, with the last three, even when they are grown in a light sandy soil best suited to their welfare.

Our search for the explanation of the effect of grass on trees consisted, in the first place, of an examination and exclusion, one by one, of the various causes which might be suggested for the action. Of these, space will allow only of the mere enumeration of the majority : the alterations produced by grass on the aëration of the soil, the carbon dioxide content of the soil, the temperature of the soil, its possible alkalinity, its physical condition, and its bacterial condition ; and in all these cases negative results were obtained. A little more

may be said, however, as to the examination of effect of grass on the supply of water and food reaching the tree.

That the growth of grass is accompanied by the evaporation of much water from the soil is well known, and, though this may generally result in the soil below grass becoming drier than that where the surface is kept tilled, this is by no means always the case, for, though water is lost by the physiological action of the grass, the grass protects the soil from a loss of water due to physical causes—the action of sun and wind—and the balance of these opposing actions may sometimes be in one direction, sometimes in another. As a matter of fact, it was found that, in the case of the original grassed plots of apple trees at the farm, the soil under the grass was, during the two years when observations on this point were made, actually wetter than that in the neighbouring tilled plots, so that lack of moisture could not be the explanation of the effect in this case. Numerous other direct experiments have been made on the subject, and all led to the same negative conclusion: where the trees were benefited by additional water, those in grassed ground were benefited to the same extent as those in tilled ground, but the additional water, even when supplied from below the roots of the trees, so that they should receive it before the grass, did not obviate the deleterious action of the grass. The most conclusive evidence on this point was obtained by growing trees in large earthenware pots, when, by weighing the pots every day or two, the water contents could be kept up to some definite standard, or altered to a known extent.

The question of nutrition is intimately connected with that of the water-supply, for in a fertile soil, so long as the trees are not in want of water they cannot lack nutrition. That the growth of grass impoverishes the soil in our experiments cannot be maintained: the grass, when cut, is not removed, but is left to rot on the ground, and direct analysis of the soil has shown that, in accordance with what has been established elsewhere, grassed soil is actually richer than the tilled soil; and this has been further established by finding that trees will flourish better in soil which has grown grass than in soil which has not done so. Thus, if the trees under grass are suffering from starvation, it is starvation in a land of plenty; and this is just the characteristic of toxic action—the presence of some baleful agent which prevents the plant from assimilating such nourishment as is present.

As in the case of the water-supply, pot experiments have been found most useful in examining the question of the food-supply, and special attention may be drawn to certain of these. Several series were made wherein the trees were grown without grass or with grass, and, in cases where grass was present, the grass roots were, in some instances, allowed to intermingle in the usual way with those of the tree, whereas in others they were prevented from so doing by a layer of very fine copper gauze placed four or five inches below the surface of the soil, all the water and nourishment supplied being added from below, so that the trees could take what they wanted before it reached the grass. Yet this almost complete separation of the grass from the trees failed to diminish

appreciably the baleful effect of the grass. Subsequently the separation was made quite complete by growing the grass in separate iron trays, which fitted like a collar round the trees on the surface of the soil: the trays were perforated at the bottom, a sheet of fine copper gauze being placed over the perforations to prevent any downward passage of the grass roots. It was impossible with such an arrangement that any effect which the grass might have on the trees could be explained by its sucking up the water and nutriment from the soil in which the trees were growing, but must have been due to what passed downwards from the grass to the trees; yet the deleterious effect of the grass persisted with scarcely any abatement. The results of various series of such experiments may be summarized as follows, the growth of the trees without grass, measured in various ways, being taken as the standard of comparison, and represented by 100:

—	No Grass.	Grass.		
		No Gauze or Trays.	Gauze.	Trays and Gauze.
Vigour . . .	100	59	61	66

The effect of the grass, it will be seen, diminishes somewhat as the separation of it from the tree-roots becomes more complete, but only to such a small extent that it may well be due, not to the more perfect separation at all, but to the reduced vigour of the grass itself, consequent on its growth having been restricted by limiting the extension of its roots; for in numerous other experiments, which cannot be quoted here, it was shown, as might have been anticipated, that the baleful effect of surface growth is more or less proportional to the vigour of that growth.

By using a collar with a larger central opening, the arrangement just described was adapted to growing plants other than trees in pots, with and without surface growth; and in these cases the trays were made of earthenware, their construction being evident from a glance at fig. 56. The perforations in the trays were covered, as in the former case, with a layer of copper gauze, and in all the check experiments there were similar trays with gauze, containing the same weight of earth as those wherein a surface crop was grown. The pots measured 16 inches in diameter internally, and contained about 70 lb. of soil, the trays containing 20 lb.; all the water supplied was added to the trays, and allowed to soak down through them into the pot below, the pots being kept up to the standard weight by frequent weighings.

In this way it was ascertained that the deleterious action of grass on trees was only a special instance of a general action: sixteen kinds of plants have been examined as regards their sensibility to the effect of surface growth, and all have been found affected; whilst the various plants grown as a surface crop number six (not counting different varieties of the same species), and all have been found to behave in a

similar way. One or two of the results obtained are illustrated in fig. 56. The extent to which surface growth affects a plant varies between wide limits, according to the nature and vigour of that growth, and the nature and vigour of the plant affected: the smallest effect observed has been a reduction of 15 per cent., the greatest, one of over 99 per cent.; the average reduction in these pot experiments is over 50 per cent., and is approximately equal to that observed in the case of the action of grass on trees.

Special mention may be made of one experiment which appears to be a crucial one in establishing the fact that the damage done to the plant in the pot is caused solely by the action of something produced in the soil by the surface crop. In this there were two sets of pots with the perforated trays, as in other cases, one carrying a surface crop, the other without such a crop, but there were also two similar sets wherein the perforations of the trays had been blocked, so that no leachings from the surface crop could reach the plants in the pots below. Where the passage of the leachings was thus prevented, the presence of the surface crop had no effect on the plant in the pot, instead of reducing its vigour by 63 per cent., as was the case where the leachings were allowed to reach the plant (fig. 57).*

Two points of importance must be noticed: it is highly probable, both from general considerations, and also from a consideration of the results of our experiments, that different plants differ both in their susceptibility to the action of surface growth, and to the effect produced by them when grown as a surface crop (cf. the different extent of the action of grass and clover as illustrated in fig. 56): but positive proof of this is very difficult to obtain, since for any such comparison we must have both plants and surface growth of a like degree of vigour in the cases to be compared together. The second point is that the action of surface growth is equally apparent when the plant affected is of the same nature as that constituting the surface growth, as it is when the plants are not the same; indeed, so far as our results can tell, the action of a plant on one of its own nature is even greater than its action on one of a different nature; but, for the same reasons as those given above, positive proof of this can hardly be obtained.

If a plant can affect others of its own nature, it is clear that it must affect itself, and it is, therefore, impossible to grow any plant without it suffering from its own poison. The plants grown in the pots when there is no surface growth in the trays must suffer in this way, and the reason why they suffer more when there is growth in the trays, is that they are not only subjected to the influence of the toxin produced by

* In a similar experiment quoted in the *Annals of Botany*, xxxi. 182, a reduction of over 99 per cent. was observed. This is explained by the fact that the experiment in question was carried out in the winter, when growth was so slow that the toxin had an abnormally long time in which to act upon and stunt the young plants.

It will be seen from the illustration here given that the growth of the plants in the pots is not so satisfactory when the trays are not perforated as when they are: this is due to the difficulty in properly adjusting the water supply in such a case. The plants in the unperforated trays also suffer, owing to the toxin formed by them not being washed away.

themselves, but also to that produced by the plants in the trays, which must generally amount to two or three times that produced by the plants in the pots.

Ample evidence could be adduced to show that the fertility of soil is eventually increased by growing crops in it, provided that the crops are not allowed to exhaust the soil: it follows, therefore, that any toxic effect produced by the growth of a plant must be of a temporary character only, and that the toxin must become changed, probably by oxidation, into plant-food. Many general instances might be quoted in support of this fact, but this is hardly necessary; we may, however, quote one particular experiment carried out in pots which illustrates this point very forcibly. Trees grown in soil which had not been grassed were compared with others grown in soil from an adjoining plot of ground which had been under grass for many years, and the vigour of growth of the latter was found to be over twice as great as that of the former; but when they were grown in this same fertile soil with the turf replaced on the surface, their vigour was reduced to half of what it was in the less fertile soil without grass. The soil from the grassed land was beneficial, and it was only while the grass was actually growing in it that it was toxic.

The disappearance of the toxic property is apparently rapid: in experiments with trees in pots, when the washings from the grass in the trays, instead of being allowed to run immediately down to the roots of the trees, are collected in a separate pan, and not supplied to the trees till some hours afterwards, they are found to have lost their toxic properties, and, possibly, to have acquired some slightly beneficial property; even the interposition of a layer of two inches of pumice between the soil in the pots and the trays carrying the surface crop, when these trays are still *in situ*, allows sufficient oxidation of the leachings to produce an appreciable reduction in the toxic effect. A similar result was obtained in some experiments in the field, when trees were grown in tilled ground, and in ground which was grassed under different conditions. The effect of the grass, when it entirely covered the roots of the trees, was to reduce the vigour of the latter from 100 to 5 in the course of four years, but when the grass was not allowed to come within three feet of the stems it produced an actually beneficial effect at first, the toxin formed by the grass having time to become oxidised before reaching the tree roots, and it was only after two years, when the roots began to extend into the grassed area, that the toxic effect began to be felt.

RELATIVE VIGOUR OF TREES.

—	1910.	1911.	1912.	1913.
Ground tilled	100	100	100	100
Ground turfed	70	30	6	5
Turfed to three feet from stems .	132	145	78	61
Allowed to grass over . . .	101	38	12	10
Turfed and fed.	69	30	9	28

Two other experiments in this series are quoted, though they do not bear directly on the particular point now being dealt with: in one the grass was allowed to re-establish itself gradually, instead of the turf being replaced at once, the result being that the deleterious effect also became established only gradually; in the other the turf was replaced, but was fed off first by sheep, and then by poultry; yet this feeding off effected no reduction in the toxic action except in the last year, when the reduction was explicable by the grass above two of the trees having been almost entirely killed by the poultry.

The action of one plant on another being a general one, it follows that trees should be prejudicial to grass, just as grass is prejudicial to trees. We have been able to establish this by pot experiments, in which grass was grown in the pots, and apple seedlings grown as a surface crop in the trays. That in ordinary practice crops under trees suffer is well known, and the following experiment shows that this cannot be fully accounted for, either by the shading due to the trees, or by the exhaustion of the ground by their roots. A plot of ground which was partially and irregularly occupied with fruit trees of different sizes, mostly standard apple trees, was selected, and, after due preparation, was planted with Brussels sprouts. The areas of the patches of ground under the trees varied from four to eighteen feet square, and similar patches were selected in parts of the ground where there were no trees, and a shading effect, certainly greater than that produced by the trees themselves, effected by erecting over them canvas screens. At the same time other patches of the ground were marked off where trees had been growing, but had been cut down just before the sprouts were planted, the roots being left undisturbed in the soil. The results of two years' observations showed that the sprouts under the trees were only 70 and 50 per cent. as vigorous as those in the unoccupied ground, but that this reduction in vigour was not in any way attributable to the shading, for those under the screens showed no reduction at all; nor could it be attributed to the exhaustion of the soil by the growth of the trees in it during the previous twenty years, for the sprouts planted on the sites from which the trees had been removed gave, on the average, exactly the same values as those planted in ground where no trees had been growing; indeed, during the first season, they actually flourished better.

RELATIVE WEIGHTS OF BRUSSELS SPROUTS.

Situation.	1915.	1916.
Open ground	100	100
Under trees	72	52
Under screens	100	103
On former tree sites	112	89

Important evidence bearing on the question of toxin production by plant-growth is afforded by the results obtained on investigating the character and behaviour of soil which has been heated.

If the growth of plants in soil produces a toxic substance, we should expect that some toxin must exist in all soils under normal conditions. That such is the case has been established by our examination of heated soils. When a soil is heated to various temperatures short of that at which destruction of organic matter begins, the proportion of soluble matter, both organic and inorganic, in it increases rapidly, and the soil becomes toxic to plant growth, and also to the germination of seeds ; and, from a comparison of the amount of soluble matter present after heating to different temperatures, it is clear that such changes must extend down to ordinary atmospheric temperatures, that is, that a certain amount of such toxic substances must be present in soils which have not been heated by artificial means. This is also shown by the fact that seeds germinate more easily in a wet inert medium than in soil. As to the toxicity of heated soils, there can be no question : when freshly heated soil is examined by its effect on the germination of seeds, it is found that it retards this germination, so that the period of incubation is increased by nearly 100 per cent. when the temperature of heating has been 150° C. (curve 0 in fig. 58). But this toxic effect disappears after a time ; forty-four days after the heating its retarding effect is greatly reduced (curve marked 44), and after 106 days it has nearly entirely disappeared. When the toxic properties of the heated soil are examined by growing plants in it, the results are, in consequence of this reduction of toxicity with time, as well as of certain bacterial changes consequent on the heating, somewhat obscured, for the growth of the plants occupies a much longer period than the germination of seeds, and during this period the toxicity is rapidly disappearing. When the temperature to which the soil has been heated is not high—these temperatures are marked on the pots in fig. 59—the proportion of toxin is not large, and it becomes more or less completely oxidized into food-material before growth progresses very far, so that we get an increased vigour in such cases ; but where the temperature has been higher, and more toxin is present, its effect is more persistent, and becomes apparent from the stunting of the plants. This was still more evident at an earlier date in the growth of the plants, though, unfortunately, no photographs of the results were taken then, but a photograph taken at a later date is enough to show that, as time goes on, the toxic effect diminishes, and the plants in the more highly heated soil, though still somewhat stunted, have outstripped in weight those in the less heated soil, giving clear proof that much more food-material must have been available in their case, and that the only reason why it did not operate at an earlier date must have been the existence of some adverse circumstance preventing the plant from benefiting by the food which was there : that is, that some toxic influence was operating. Similar results with other plants were obtained, telling the same tale.

That the toxicity of heated soils is due to the decomposition of the organic matter in the soil cannot be doubted, and a like decomposition must occur, though less readily, at ordinary atmospheric temperatures (indeed, the germination results prove that so-called unheated soil

contains some toxin), and, as most of the organic matter in soil is the product of plant-growth, it follows that more toxin will be produced where plants are growing than where they are not, hence the toxic effect of one plant on another. The ultimate decomposition of the toxin into food-material, demonstrated by the results with heated soils, also explains the increased fertility observed in a soil which has grown a surface crop, as soon as that surface crop is removed, and the production of toxin ceases.

What the toxic substance is, has not yet been ascertained, but an

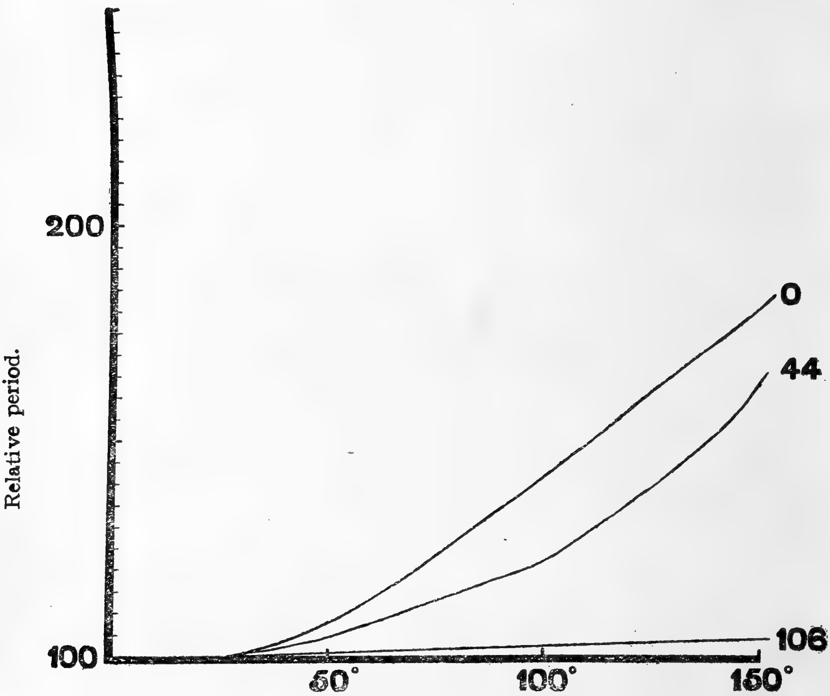
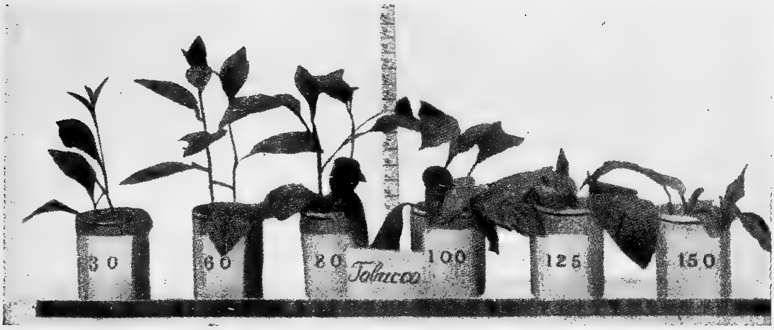


Fig. 58.—Incubation Periods of Seeds in Heated Soils.

examination of it is now in progress from the chemical point of view. Those experiments, of which some account has been given here, all go to prove that the toxin is a substance which can be oxidized, or, in chemical parlance, that it is a reducing body, and it has been found that there is such a body present to a certain extent in extracts from all soils, and that the proportions of it are increased by growing a crop in the soil, or still more so, by heating it. But the question is evidently one of great complexity which cannot be dealt with in the present communication; it may be said, however, with confidence that the toxin is not dihydroxystearic acid, which, according to the views expressed by workers in the Soils Bureau of the United States, is the main substance accountable for the infertility of certain soils.



Tobacco, July 28.

Tobacco, August 25.

FIG. 59.—TOBACCO GROWN IN SOIL WHICH HAS BEEN HEATED TO DIFFERENT TEMPERATURES.

[To face p. 380.

THE FUTURE OF ALLOTMENTS.

By W. H. Morter, F.R.H.S.

[Read August 14, 1918; Mr. F. J. Chittenden, V.M.H., in the Chair.]

I have been requested to give you a short paper on the Future Aims for Allotment Workers in Industrial Centres. This subject, to me, seems such an important one and one full of such possibilities for the benefit of the town-dweller, not only for the production of food in the future, but also for the physical benefit of the allotment holders, that I think a short history of the work done under the Cultivation of Lands Order in my own city would be of interest. Up to the end of 1916 there were about five thousand allotments in the city—between 3,000 and 4,000 under the control of the Corporation, and the remainder privately owned. At the commencement of the year 1917 the Cultivation of Lands Order was issued, and under that Order various plots of land—some that had lain derelict for years, and others awaiting building development—were immediately taken possession of and laid out in plots. It was anticipated that a further 2,000 plots added to those already under cultivation would be ample for all requirements, but such was the demand that by the end of April (or in four months) no fewer than 6,000 new plots, representing 600 acres of land in various parts of the city, had been laid out and put under cultivation. Although the demand was not yet satisfied, it can be imagined that to obtain land for the purpose was getting extremely difficult, for not only were the land agents and owners averse to giving up the land, but, as most of the grass land in and around the city was let to the various wholesale butchers &c. as accommodation land at high rents, the problem faced us as to whether it would be just and proper to utilize this land for allotments. After consideration, it was decided that more food could be produced by cultivation than if left in its present condition as accommodation land, and much of this land was then taken under the Second Order of February 1917, although at the same time due consideration was given to the tenant so that he should still have a portion left on which to graze his diminished supply of cattle. Sundry farm lands that were not being cultivated to their fullest capacity were also taken and divided up. Under this scheme a further 6,000 plots, making altogether 12,000 War Allotments, have been put under cultivation in eighteen months, and yet there is still a demand for more and more. When the scheme was first put into work the city was divided into thirty districts, and thirty experienced men were appointed to take charge of a district each, their duties being to plot out the land and let it to suitable applicants and also to give instruction in cultivation, as it was obvious there would

be many applicants from a big city anxious to grow their own supplies who would be totally ignorant of the proper way to dig and cultivate a plot. This scheme has worked remarkably well, and I think I am perfectly safe in saying that out of this large number of new plots (many in the hands of inexperienced people) not one per cent. can be found improperly cultivated. This, I think, shows the necessity of providing for this kind of cultivation in the future, and I suggest the question of the provision of suitable land for allotments after the termination of the War is a subject that will have to be seriously considered by Municipal Authorities throughout the country, but more especially by those of large cities and towns.

It has been stated by some well-known authorities that the demand may probably decrease after two or three years, as for instance in the case of Croydon, where a large number of allotments were demanded and provided about twelve years ago and which gradually fell out of cultivation, so much so that at the present time these plots are lying idle; but I should like to point out that the necessity for growing food in these islands twelve years ago was not comparable to the needs of the present day. At that time and for some years after, so much food was imported and home-grown stuffs could be obtained so cheaply that individuals were not inclined to cultivate their own; but, at the present time, the need for reducing the imports and increasing the food supply in our own country is of paramount importance, and in my opinion this need will continue, not only for the duration of the War, but for some years after, owing to the great shortage of transport. Again, the great benefits that are being derived by the plot-holders, not only by supplying their own wants with fresh vegetables and fruits, but also to their general health, will not be readily forgone; and I submit, therefore, this provision is one that should be taken in hand at once, so that, when the present War Allotments are required for building purposes immediately the ground is released by the Board of Agriculture, Municipal Authorities should be in such a position that they will be able to transfer the holders to other suitable land that will be held permanently for this purpose.

How can this be arranged?

Many Municipal Authorities now have certain powers given them by the Local Government Board under the Town Planning schemes, and I suggest that, when the plans for these schemes are being prepared, certain areas of land should be obtained in each district for the provision of allotments. I think a reasonable amount should be not less than twenty acres for every thousand houses to be erected, and these plots should be in such a position as to be easily accessible. This will provide a plot of 300 sq. yds. for each fourth house only, and it may be argued that under the Town Planning there will be adequate ground provided for each house, but I am of opinion that such ground will be more often used for the cultivation of flowers and lawns than for food production, and that such areas for vegetable-growing as I have suggested would be eagerly taken up.

In some of the larger cities this proposition may seem absurd, as in Birmingham, for instance, it would probably mean about 5,000 acres to be provided; but however large the scheme appears at first sight, I am of the firm opinion that this land would be readily taken up and cultivated. The land chosen for the purpose should preferably be of good tilth; but I consider the first essential is to have the areas for allotments in near proximity to the dwellings, or at least within fifteen minutes' walk of transport, such as trams, 'buses, &c. At the present time in Birmingham we have men working allotments—and working them exceedingly well—whose homes are from six to eight miles from their plots, but it is only those who are very keen that are doing this, and the majority of allotment-holders could not give the time and attention required to their plots if too far away from their homes; the question of carriage to and fro should also have a big influence.

The most suitable sites to be obtained for this purpose would be land with a good depth of soil and preferably facing south, but this cannot always be arranged. However, whatever the position of the ground, the main roadways should run due east and west, so that the plots can be arranged to meet this road endways, and the crops could then be planted with rows running north and south. The plots I suggest most suitable for permanent allotments should be 300 to 400 sq.yds., and arranged so that a two-foot path can run between every pair of plots for the convenience of the owners on each side.

Huts.—The present habit of placing huts in any position on an allotment is most deplorable, and I suggest that those in charge of allotments should insist on these huts being placed in such a position as to be properly in line, preferably on the side of the main roads leading into the allotments. These could be so arranged that one hut of say 12 by 5 feet would answer for two allotments with a partition in the centre. They should also be made more or less to an approved design. This would be not only more pleasing to the eye, but also more convenient for the owners. Municipalities should be able to arrange to supply these huts either at cost price or at a yearly rental.

On each block of allotments I consider it is also necessary to have a good building which could be used for storage of artificial manures, or for any meetings of the allotment-holders connected with the plots adjoining.

Pigs.—The question of keeping pigs and other live stock on allotments is one bristling with many difficulties, but I suggest this should be encouraged wherever possible. In many cities by-laws have been so stringent as to make it almost impossible for any householders to keep pigs near their homes, but these have now been considerably relaxed for the period of the War. There is little doubt, however, in my mind, that on the return to normal conditions these by-laws will be again put into force. It therefore behoves every block of allotment-holders to consider the advisability of making such provisions as may be necessary, either for pig-keeping on the co-operative principle or by

erecting such buildings as may be necessary for this purpose. I am afraid any other live stock, such as rabbits, chickens, &c., could not be kept any distance from home in the proximity of large towns for reasons that will be obvious to you all.

Fruit.—I do not consider it would be wise to recommend any holder of war plots to plant fruit, as the expense incurred would be wasted should the land suddenly be required for other purposes; but on permanent plots I would certainly recommend that bush fruits should be planted to assist with the food supply.

Flowers.—The growing of flowers on an allotment at the present crisis would probably be regarded as pleasure-gardening at the expense of the community for the sole benefit of the individual. This may be so in many cases, but where a plot-holder resides in the centre of a densely populated city, I certainly think a small corner of the plot should be put aside for this purpose, so that he should be enabled to grow something that would brighten the home as well as increase the food supply. I think sometimes too much fuss is made when a small portion of an allotment is given up to flowers without first considering their real value, although, when an allotment-holder has a garden adjoining his residence, he certainly should not want any space on his allotment for this purpose.

Security of Tenure.—Many representations with reference to this point have already been made by different councils of the Board of Agriculture and Fisheries, and only recently the following letter has been received by Mr. REGINALD GRAVES, clerk to the Tottenham Urban District Council, from Mr. PROTHERO :—

"I am directed by the President of the Board of Agriculture and Fisheries to refer to your letter of the 1st instant, enclosing petitions asking for security of tenure in respect of land which has been provided for allotments under the Cultivation of Lands Orders.

"I am to point out that the Corn Production (Amendment) Bill, which has been introduced by the Government into the House of Lords, is intended to postpone Part IV. of the Corn Production Act, 1917, which would otherwise come into operation on the 21st August next, and to continue in operation until the end of the war the provisions of the Defence of the Realm Regulations under which the Cultivation of Lands Orders have been made. The result of passing the Bill will be that the Board, and the local authorities acting on their behalf, would be able to retain possession until the end of the war of any land which has been taken over under the Order, and the provisions of the Defence of the Realm (Acquisition of Land) Act, 1916, will enable possession to be retained of such land for the period of two years from the end of the war.

"The Government have, therefore, redeemed their promise that legislation would be introduced to safeguard the position of the allotment-holders, and as soon as the Bill is passed they will be secured in the continued occupation of their land, at least until the expiration of two years from the end of the war, except in those cases where it

is shown to the satisfaction of the Board that the land is required before that date for building or other public purposes. If it should be necessary to dispossess any allotment-holders for such purposes they will be compensated by the Board for the value at the time of quitting of the crops growing on the land and the labour expended upon and manure applied to the land since the taking of the last crop in anticipation of the future crop.

"With regard to the position of permanent allotments after the war, I am to state that the Government recognise fully the social and moral advantages of the allotment movement, and that it is their desire to take any necessary steps to establish it formally as a permanent feature of our national life. It is not practicable, however, to introduce further legislation on this question this session, but in the meantime the legislation already introduced will safeguard the position of the present allotment-holders, and will renew the power of the Board and the local authorities to acquire more land during the continuance of the war."

This, to the allotment-holder, is a very strong point, and in connexion with this some extracts from a letter sent to one of the daily papers are worth quoting, viz. :—

"Allotment-holders are to be given security of tenure of their allotments until the autumn of 1920.

"Those who desire it ought to be given security of tenure *for the rest of their lives*, conditional on their allotments being tilled by themselves or resident members of their families.

"The national exchequer would, of course, have to buy out the landlords at an equitable price. Is this too big a proposition when millions of pounds are spent for far less valuable purposes than intensive cultivation of British soil?

"Public playgrounds are sacred, but food production has become more sacred. The difficulty as regards allotments situated on valuable building sites could be solved by grants of other allotments of equal size within the same radius of holders' homes.

"The patriotic allotment-holders have converted wastes into oases and barren lands into rich kitchen gardens. They have immeasurably helped out the anxious food problem. Every one of them is a lesser RHONDDA or HOOVER.

"And their love of their patches of ground has become that passion of the gardener that exceeds the devotion to any other work or hobby. One cannot think of a day when all the allotment-holders will be told, 'You must surrender now.' One cannot imagine a gardener leaving his garden for ever on the striking of a clock. If we do not give the allotment-holders their allotments we ought to keep mobilized at least an army corps of official ejectors for that day."

This, I think, expresses the general feeling of the allotment-holder throughout the country, and for the needs of the food supply for some years to come there will be an urgent call for greatly increased production, as in the event of a blockade of our coast-line we should find

the home produce so infinitesimal that in a very short time the inhabitants of these islands would be reduced almost to a state of starvation; and when we consider that many of these inhabitants would be only too pleased to do their share towards this increased production, if only security of tenure could be assured, I am sure you will all agree with me that we must all do our best to bring about this necessary improvement in the provision of land for allotments and the necessary security for these workers.

Waste Land.—We are informed that there are 17,000,000 acres of uncultivated land in these islands, but, unfortunately, this land is situated in such positions generally as to be of little use to the inhabitants of large towns; but I suggest one has only to spend a few hours on the outskirts of any municipality to find still plenty of land that could be put to much better uses than at present, and if this could be obtained for allotment purposes, the food supply would be thereby considerably increased both for the benefit of the workers themselves and also to benefit the country generally.

The scheme just being put into operation by the Board of Agriculture, viz. the formation of Horticultural Committees for certain specified areas to have control under the Board and to be empowered to elect District Food Production Committees to work in conjunction with them, is in my opinion good; but there are other points which should be considered and added to the scheme. For instance, the scheme brings forward the necessity for the establishment of trial grounds in various districts where new varieties of vegetables &c. could be tested side by side with established and well-known varieties, so that the local allotment-holder would be able to tell at once whether these new varieties were more suitable to him and for his district without wasting at least a season in testing them himself. The Parks Committee of the Corporation of Birmingham in conjunction with the Royal Horticultural Society have already put this scheme in working order, and six trial grounds of from one to five acres in extent have been established in the Parks in six different districts of the city for the benefit of the allotment-holders to show the results on the various soils on which this city stands. I suggest this measure should be encouraged by the Royal Horticultural Society in other cities, as it is obvious that, however anxious, it is certainly impossible for the societies affiliated or that will affiliate, if far distant from the Wisley Gardens, to visit them, and I suggest that by encouraging the extension of demonstration plantings of this kind the Society will be doing good work for the country, and will at the same time still further advance its laudable aims.

I suggest also that Societies should be encouraged by temporary loans to purchase their own plots, this giving them a still keener interest, and much can be done by co-operation, both in the purchase of lands, tools, manures, &c.

The panel lecturers appointed in the various counties should be called upon more frequently, especially during the winter months,

not only for giving lectures, but also for chats on the cultivation and growth of various varieties of plants for food production suitable to their particular districts, as it is obvious that those living in a certain district are the best judges of the crops which thrive best in their own locality, whilst at the same time special lecturers should be appointed to visit the districts and deal with more general subjects.

The Education Committees of the various cities would, I feel sure, be only too pleased to assist in this good work by giving permission for the district schools to be utilized for these lectures at any time.

THE EFFECT OF THE FROSTS OF THE WINTER OF 1916-17 ON VEGETATION.

By E. A. Bowles, M.A., F.L.S., V.M.H.

At the meeting of the Scientific Committee on April 11, 1917, it was agreed that it would be desirable to collect evidence of the damage done to plants by the cold of the winter just past, and that a report should be drawn up from the result. This recommendation was accordingly brought before the Council of the Society, and having been approved, the following letter was circulated:—

Vincent Square,
Westminster, S.W.1.
June 1917.

Dear ——

The last winter (1916-17) has been so prolonged and the frost so exceptional in many places that injury to vegetation is said to be widespread.

Further, the nature of the injuries is represented as being different in character and degree from the experience of 1908-9, and also to plants other than those noted in the report published by this Society after that winter.

The Council consider it to be desirable that a report should be drawn up dealing as fully as possible with the present damage, that it may, when convenient, be published in the R.H.S. Journal, and has requested me to collect details on the subject. Will you, therefore, kindly fill up the enclosed forms, and return them to me at Vincent Square at your early convenience. Additional forms will be sent if requested.

It is especially desirable that notes should be collected on plants introduced since 1908, but older plants mentioned in the former report (*see* R.H.S. Journal, vol. xxxvi., Part II., p. 358, Nov. 1910) should also be included for comparison.

I am, yours truly,
E. Augustus Bowles.

Forms A. and B. were similar to those sent out for the Frost Report on the winter of 1908 and 1909 (see Journal of R.H.S., vol. xxxvi., Part II., p. 366 *et seq.*). Form C. asked for information as to plants killed or injured in 1908-9 but which in 1916-17 escaped injury, or survived with but slight injury. Form D. was prepared for lists of plants introduced to cultivation since 1908, and arranged to show whether they had been injured or no.

Considering the difficulties besetting garden work at the time, the response to this request was sufficiently general to warrant drawing up this report.

The thanks of the Society are herewith tendered to all those who so kindly and so carefully filled in the forms, or provided the required information in other ways.

Special thanks are due to Mr. Vicary Gibbs, who most kindly and generously placed at our disposal a valuable report on the effects of the winter at Aldenham.

He was intending to publish it, along with a list of the plants injured or uninjured, in the gardening press, but, on hearing that the R.H.S. proposed drawing up a report, he at once expressed his willingness to allow his work to be incorporated with it in any manner we deemed most desirable.

FORM A.

SCHEDULE OF QUERIES.

1. Locality of garden..

2. Height above sea-level..............................

3. Is the surrounding country open..

or

Is the garden sheltered by hills, &c. ?..

4. Is there any large body of water near ?..

5. Has the garden suffered any great damage from frost during the winter of 1916–17 ? If possible, please say how the amount of damage compares with that experienced in previous severe winters..
....
....

6. What were the lowest temperatures recorded during the winter ?

(1) On Grass.........date............ (2) In Screen......... date.................
If the thermometers are placed in positions other than these, please give exact situation and exposure..

7. Have the thermometers been verified at Kew ?...............................

8. If not, are the thermometers ordinary minimum, or "Six's" ?.................

9. How do the temperatures compare with those experienced during other winters ? ....
....

10. How long did the frosts last ? ....

11. Was snow on the ground at the time, and how much ? ....

12. What was the general character of the autumn months in the district ?
....

13. What is the nature of the soil and sub-soil ? ....

14. Please give any further particulars regarding the climatic conditions that you think may be of service in drawing up the report ?
....
....

Name.. *Address*......................................
....

FORM B.

List of Plants Injured by Frost during Winter 1916–17.

1 Name of Plant.	2 Approx. Age.	3* Situation with regard to Exposure.	4 How long Planted in this Situation.	5* Extent of Damage. A, B, &c.	6 Remarks.

* The following abbreviations may be convenient :—
Column 3.—N = exposed on north ; S = south ; W = west ; E = east ; X = sheltered all round ; Y = wet at roots ; Z = dry.
Column 5.—A = killed outright ; B = killed to ground level ; C = much injured ; D = slightly injured.

FORM C.

PLANTS KILLED OR INJURED IN 1908–9 (see "R.H.S. JOURNAL," vol. xxxvi., Part II., p. 366 *et seq.*) BUT WHICH IN 1916–17 ESCAPED INJURY; OR, SURVIVED WITH BUT SLIGHT INJURY.

1 Name of Plant.	2 Approx. Age.	3* Situation with regard to Exposure.	4 How long Planted in this Situation.	5* Extent of Damage. A or B	6 Remarks.

* The following abbreviations may be convenient :—
Column 3.—N = exposed on north; S = south; W = west; E = east; X = sheltered all round; Y = wet at roots; Z = dry.
Column 5.—A = escaped injury; B = survived with but slight injury.

FORM D.

PLANTS INTRODUCED TO CULTIVATION SINCE 1908.

1 Name of Plant.	2 Approx. Age.	3* Situation with regard to Exposure.	4 How long Planted in this Situation.	5* Extent of Damage. A, B, &c.	6 Remarks.

* The following abbreviations may be convenient :—
Column 3.—N = exposed on north ; S = south ; W = west ; E = east ; X = sheltered all round ; Y = wet at roots ; Z = dry.
Column 5.—A = escaped injury ; B = survived with but slight injury ; C = much injured ; D = cut to the ground level ; E = killed outright.

His introductory article is printed herewith in full, and the lists of plants have, with his consent, been incorporated in the general list.

THE WINTER OF 1916–17 AT ALDENHAM, ELSTREE, HERTS.

"The winter of 1916–17 was the most severe that has been experienced since that of 1894–5, and I consider that it offers a fair test of hardiness; I mean that any plants which survived it at Aldenham with no, or slight, injury may be tried with fair prospect of success in almost any part of England.

"At no time during last winter was the thermometer abnormally low; the lowest reading at Aldenham was three degrees above zero in a screen protected from the north, whereas in January 1895 we touched three degrees below zero; but the disagreeable feature of last winter was a continuance of bitter east wind which, if not fatal to plant life, resulted in severe damage, defoliation, and disfigurement. Indeed, any one who examines the following lists will be struck by the small number of shrubs or trees which have actually perished.

"As will be seen, I have divided the plants into those which are uninjured, slightly injured, severely injured, and killed. This sounds simple enough, but in practice it is not so easy to decide what constitutes severe injury as would appear at first sight. The natural way would be to regard severe injury as having occurred where a plant has been killed to the ground level, or at any rate has had the branches and a good deal of the stem destroyed, and this is the view which, generally speaking, I have adopted.

"Such a happening is, however, of very diverse effect in the case of plants of quite different character; e.g. a Cypress, Juniper, or other Conifer so suffering is for all practical purposes ruined, and in the case of a broad-leaved tree such as an Ailanthus, though ultimate recovery may be possible, yet the growth of years may have been destroyed, and the symmetrical form definitely spoilt. On the other hand, in the case of Fuchsias, Perowskias, Caryopteris, and most of the Hypericums, being killed to the ground is a very ordinary event which takes place with me in much milder winters than the past, and which does little or no harm to the subject; indeed in some cases, where the plant has become scraggy, is an actual improvement. Writing as I do towards the end of July, I find plants of this nature which undoubtedly were killed to the ground, but which have grown again so vigorously that anyone who looked at them without minute investigation would pronounce uninjured.

"Aldenham seems to me for more than one reason a place where a catalogue such as follows should form a good test of hardiness, and a guide for those proposing to plant a garden in the colder parts of England. It is no doubt very gratifying for Mr. WILLIAMS at Caerhays or Sir JOHN ROSS at Rostrevor to show their friends magnificent examples of *Embothrium coccineum* or *Desfontainea*

spinosa, but disappointment would follow an attempt to emulate their successes in Staffordshire or Northants.

"Aldenham, however, is a fair average place for climate, not the very worst, but some ten degrees colder than favoured parts of Surrey and Sussex; it has a cold clay subsoil, practically without lime, does not suffer specially from winds, a moderate rainfall of 24 inches average in the year, and therefore on the dry side, is subject to very bad spring frosts, and enjoys all the variability of English weather, so that in the last ten years we have registered frost in every month of the year.

"With this explanation before them your readers will be able to judge what are the conditions under which plants have either lived or died in Herts. The collection there is so extensive with regard to all hard-wooded plants that are generally reputed hardy, save for Conifers and peat-loving shrubs such as Rhododendrons, which are unsuited to the soil, that with these exceptions, and a few great rarities, I think it will be possible for anyone to find out the fate of any hardy tree or shrub in which he may be interested.

"Of course in the limits of an article such as this it would be quite out of the question to enumerate all the inhabitants of the Aldenham gardens. I have therefore omitted nearly all quite common species which have escaped uninjured, though where they have suffered in any degree, such as the common holly, yew, and Mahonia, they are listed.

"I have also left out all varieties (a goodly number) except in the few cases where I have satisfied myself that the variety is hardier or tenderer than the type: an illustration of the former is *Viburnum foetidum rectangulum,* which has come off much better than the type, and of the latter *Rhus Cotinus atropurpureus,* which has been more heavily punished than *R. Cotinus* itself. It is not easy to see why plants of the same species with differently coloured flowers or differently shaped leaves should vary in hardiness or other qualities, but undoubtedly the golden-coloured *Cupressus macrocarpa lutea* is hardier than the type, and the copper- or brown-coloured beech thrives better on our heavy clay soil than the ordinary *Fagus sylvatica.*

"I must also mention that the lists refer, unless otherwise stated, to *mature* plants, for the difference in the effect of hard frost on trees in a young state with no vigorous root development and little, if any, really hard wood, and others of the same kind when 20 feet high is most marked, *e.g.* my tree of the new Chinese *Paulownia tomentosa lanata,* nine years old and 20 feet high, and the Chilian *Nothiofagus obliqua,* about twelve years old and about 18 feet high, are entirely unscathed, whereas little plants of the former 8 inches to a foot high have been killed, and thirty plants of the latter in the nursery from 5 to 7 feet high have almost all been severely injured, the majority being killed half-way down.

"The moral of this for inexperienced planters is obvious, viz. that many trees require protection during the first eight or ten years

of their life, which thereafter can be safely left to look after themselves; the protection may be afforded by bracken or matting or merely by the close vicinity of other plants, but this story proves that trees not of extreme hardiness should not be isolated as specimens till they have reached a certain height and age.

"This last winter's severity was the more felt because it followed on several of unusual mildness; for instance, *Acacia dealbata*, which had been given me by some Cornish or Irish friend, had grown vigorously with me for five years, and had developed into quite respectable size, but was of course killed stone dead early this year. All of us had thus been tempted to try delicate things, and though most of them have now been swept away, yet some few startling successes have occurred, and new and valuable experience has been gained.

"I have always understood that for several years after it was first introduced the Tulip tree was supposed to be tender, and it was only by an accident that its hardiness was discovered; in the same way on the walls at Kew Gardens can be seen specimens of plants now of proved hardiness, which must have been assumed to require a wall for their salvation when first brought to England.

"The common horse-chestnut and the Mexican *Choisya ternata* are well-known instances of plants far hardier than their natural habitat would suggest.

"This year has furnished one or two unexpected revelations. *Lomatia ferruginea*, which I should never have even thought of trying had not my friend Mr. GERALD LODER given me a plant, though only a small cane about 2 feet 6 inches high, is absolutely untouched, and *Paliurus aculeatus*, which I had tried and lost many years ago, had only two or three twigs slightly scorched. It is true that I have only one plant of these, and as ARISTOTLE remarks, no doubt recording a then ancient proverb, 'one swallow doesn't make summer'; nevertheless that twenty-nine degrees of frost should have left undamaged these two plants placed at hazard in the shrubberies, with no other protection than that afforded by neighbouring plants, is distinctly surprising and encouraging.

"I may state here that the ensuing lists only concern plants growing in the open without artificial protection of any kind (unless so specified), and that in the case of creepers they are trained to a larch pole.

"Early in the spring I wrote a short note for 'Irish Gardening' on the effects of the winter's cold, especially with reference to the recent Chinese introductions, making, on the whole, a fairly cheerful report; that highly experienced and very good friend of mine, Sir FREDERICK MOORE of Glasnevin, warned me after reading it that I should probably prove to have been far too optimistic and that some disagreeable surprises were in store for me. I am happy to say that so far as Aldenham is concerned this warning has not been needed, and a close summer inspection brings the opposite result that in *no* case have I lost plants which I thought safe, and in several cases

shrubs as to which I had abandoned hope have broken into growth: *Olearia macrodonta* and *Raphiolepis Delacouri* both illustrate the truth of this. Indeed, I can name only one plant in this garden which shows greater injury in July than it did in March, and that is *Berberis Knightii*. However, as to this, I can only speak for Aldenham, for my friend Mr. SOAMES, who owns a lovely garden at Sheffield Park near Uckfield in Sussex, showed me about a fortnight ago several instances of plants badly hurt which up till a few weeks back appeared to have escaped.

"I remember Mr. WILSON, the well-known collector, telling me, when he was looking at his Chinese plants which I had raised from seed, that he had been at great pains to collect them from as high altitudes as possible, and his efforts in this direction are now proved to have been well rewarded. Nothing has impressed me more than the high average of hardiness among WILSON'S introductions: all his *Berberis*, except *B. levis*, nearly all his Cotoneasters, and a great many of his Viburnums, *Stranvaesia undulata*, *Ilex Pernyi*, and many more, will be found in the list of uninjured. When one looks at the wreck of a great plant of the common *Berberis Darwinii*, and at the ordinary hollies, yews, and Portugal laurels showing various degrees of injury, it is very cheering to one like myself who has grown and distributed so many species whose presence in England is due to WILSON'S energy and enterprise.

"I had intended to have included a report on plants at Aldenham, which have the protection of a wall, but a long illness prevented this being done; however, as I have but small wall space at Aldenham, a list of such plants would have been in no sense exhaustive, and must consequently have been very inferior in value and utility to that of plants grown in the open.

"A tree which last winter has shown to be entirely hardy deserves to be much more often planted than is the case at present. I mean *Plagianthus Lyalli*; those who know its delicate white flowers will, I feel sure, agree with me.

"In conclusion I would add that all my Gunneras, *scabra*, *chilensis* and its rarer form with dull red flowers introduced by Mr. ELWES, all suffered with like severity, the principal crowns being killed, though they were heavily protected with bracken and spruce boughs.

"In the case of some genera, such as Deutzia, Diervilla, Spiraea, and Philadelphus, I have not specified the different species which would run into great numbers, the collection being pretty complete, because, except for *Deutzia scabra*, *D. discolor*, and *Spiraea bullata*, which are slightly hurt, the whole of them appear to be immune to any cold, at any rate above zero.

"Of course it is not easy in every case to distinguish between injuries caused by cold and some other cause, but I have taken great pains to satisfy myself on the point before making this report, and in most cases have been able to examine several specimens of the same plant in different positions, for last winter, where so much of the

damage was caused by wind, protection from, or exposure to, the east made all the difference between severe injury or none, e.g. a tall plant of *Rhamnus Alaternus variegata* west of Aldenham House is barely touched, and a smaller one to the east of the building has lost many boughs and twigs.

"In the case of some of my rarest plants, such as *Aesculus Wilsoni*, *Emmenopterys Henryi*, &c., I am unable to report how they stood the winter, for, having only one specimen and knowing that if lost they could hardly be replaced, I kept them in large pots, and they passed the cold weather securely located in a shed.

"My first idea was to publish this article and the accompanying lists as a separate account of the effects of the winter of 1916–17 on tree and shrub life, but learning that my friend Mr. AUGUSTUS BOWLES was engaged in the heavy task of arranging and collating reports from numerous sources throughout the British Isles, I have thought it better to hand over my material to him, that he may incorporate it or make such use of it as he shall think best."

VICARY GIBBS.

GENERAL NOTE ON WEATHER OF WINTER 1916–17.

Mr. R. H. CURTIS has very kindly drawn up the following note regarding the weather of the winter of 1916–17.

"When it is desired to compare the effects of abnormal weather upon vegetation in a particular season, with those observed in corresponding seasons of former years, it is seldom safe to rely to any great extent upon one's personal impressions or recollections concerning what had occurred months, or it might even be years, before. Even when such recollections can be reinforced by memoranda made at the time, unless the memoranda are very full and complete there is still danger of a wrong judgment, owing to the fact that more than one factor capable of influencing the result has to be given its due weight; and of these factors a very important one is the condition of plant-life, as affecting its sensitiveness to injury, at the time when the abnormal weather occurred; and in addition there always remains the unfortunate—but unquestionable—fact that with the lapse of time some impressions are apt to deepen, and to acquire an undue importance in one's retrospect; whilst with others the reverse may be the case.

"It is especially desirable to bear these considerations in mind in the present case, because so many of the *data* available appear to be based entirely upon personal recollection; and an endeavour has been made to supplement and support them whenever possible by additional instrumental evidence as to the character of the weather conditions.

"For the purpose of the inquiry a Schedule of fourteen questions was sent out, asking for information as to the climatological

conditions of the period under review (the winter 1916–17) and also for details as to the damage done to plants by the frost.

"As regards the instrumental side of the data asked for, the result is not entirely satisfactory, either as regards quantity or quality. As regards the first point, they very inadequately represent the climate of the British Isles during the period. Their distribution was as follows: from Scotland, Ireland and North Wales *two* schedules were received from each; from Cumberland, Northumberland, Yorks, Cheshire, and Derby *one* from each; and from South Wales, and fourteen counties in the south of England, of which Suffolk is the most northern, a total of *forty-four.*

"Besides being scanty, the instrumental data also revealed the existence of a great diversity of method, or perhaps a great want of method of any sort, in setting up the instruments, and in observing and recording their indications. In a few cases screens had been employed for the thermometers, and the information supplied was evidently based on observations carefully and regularly made and recorded; in others a casual note revealed that the thermometers had been hung on a post, or affixed to a wall, without protection from sun or rain (?), and at heights of from one foot to five feet above the ground; and whilst there was no evidence of regularity and method in reading them, there were not wanting indications that in the absence of proper records the memory alone had often been relied upon for answers to the questions asked in the schedules, both as to the season under discussion and also those previous seasons with which they were being compared.

"It was evident therefore that the climatological data contained in the schedules were alone inadequate for the purpose in view; and it became necessary to combine with them information derived from other sources in order to arrive at a just conception of the character of the weather during the winter of 1916–17, the period under review, and wherever possible this has been done.

"It may be permissible here to remark, with reference to this lack of reliable data, that it emphasizes the need of having in every important garden a simple set of climatological instruments, which should show the temperature and hygrometrical condition of the air (a *dry* and a *wet* bulb thermometer), and the amount of rainfall; and if a record of the duration of sunshine could be added so much the better.*

"A thermometer is an unemotional instrument that, provided it be properly made, properly set up and screened from sun and rain, and regularly read, can be relied upon to give unbiassed answers to the following three questions, asked in the 'Schedule of Queries' upon which the present inquiry is based: (1) What were the lowest temperatures recorded during the winter? (2) How do they compare

* With the exception of the Sunshine Recorder these instruments *need* cost but little. It is possible to purchase thermometers quite good enough for the purpose suggested for one shilling each.

with those experienced during other winters? (3) How long did the frosts last?

"The rain-gauge, which also need not be expensive to ensure accuracy, will give information as to the relative dryness of the soil, and inferentially, in conjunction with the temperature, information respecting the probable condition of plant-life—its ripeness, amount of sap, &c.—factors which are of importance when the continued effect of abnormal temperature is being considered.

"But before dealing in detail with the weather of the winter as described in the schedules it is desirable to take a brief retrospect of that of the preceding summer. This was by no means an exceptionally warm season; indeed the early part of it was decidedly cool, and vegetation was retarded in consequence; but by the middle of July the temperature had become normal again, and August was throughout warmer than the average, and was followed by decidedly mild weather which continued till near the close of November. This unusual warmth will probably account for the remarks made on several of the schedules respecting unusual 'sappyness,' and continued growth of many plants until quite late in the year, and right up to the time when it was abruptly checked by the advent of severe frost. This point is emphasized in many of the schedules; as is also another, to which some gardeners appear to attach even more importance, namely the effect of the strong, keen winds by which in many districts the frosts were accompanied. One note speaks of wind as 'our chief enemy'; another says that 'with the bitter winds . . . the frost was more destructive than when the thermometer gave even lower readings' in calm weather; and yet another has it that 'but for the wind we could laugh at frost!'

"The *duration* of the frost, the third question to which a definite answer was asked for, and a point of importance, elicited replies which were in some cases mutually contradictory, again owing, as we think, to the absence of a written record. In three returns from one county, whose topographical features are fairly uniform from end to end, and over which the climatic conditions could have varied but little, the frost is said to have lasted (1) 'practically the winter through'; (2) 'from the beginning of January to the middle of February,' say six weeks; and (3) 'from a fortnight to three weeks'; a variation of estimate which well illustrates the risk run in trusting to the unaided memory. But generally speaking the replies to this question given in the schedules are too vague to be of much use.

"Coming now to deal with the general results of this inquiry as to the severity of the winter 1916–17, as revealed by all the evidence available, we may say that the last three months of 1916 formed a fitting close to a year which had, on the whole, been dull and wet, and more or less stormy, throughout—a typically unfavourable year for the horticulturist! Storminess was the outstanding feature of October; but with the strong south-west winds which prevailed the temperature kept rather above the average right through the month,

and on to near the close of November, when there came a change of wind to north, and with it a spell of cold which soon developed so much intensity and also in the area covered, that before long low night temperatures of between 10° and 20° Fahr. were being experienced in most parts of the British Isles. At the very end of the year there came a brief interval of south-westerly winds and with them a general increase of temperature, the thermometer rising in the early days of January to an exceptionally high point for the season; but vegetation was then in a very backward state, and at Wisley it was estimated to be quite a month later than in normal years.

"The milder weather with which the New Year began did not, however, continue very long. The wind soon got back again into a northern quadrant, and severe frosts presently became once more general, the thermometer falling as low in some parts of Ireland and England as in the north of Scotland. At Wisley on the 30th a temperature of 7° Fahr. was recorded on the grass, and a week later when this renewed spell of cold had attained its culmination it fell still lower to −4° on the grass. But all over the kingdom it was phenomenally low in these early days of February, and grass temperature readings of zero Fahr. were recorded in Surrey, Kent, Worcestershire, Radnor, Lancashire, as well as at places further north across the Border. At Wisley there had been up to this period thirty-seven consecutive days of frost; at Gatton Park their duration was six weeks; Sherborne, Dorset, thirty-four days; Tortworth, Glos., thirty-five days; Monmouth, thirty-two days; and even at St. Keverne (on the Cornish coast just west of Falmouth) 'there was a grass frost every night from January 14 to February 14.'

"For a similarly cold spell one must go back for at least twenty-two years to 1895, which year is named in most of the schedules as the most recent for comparison with 1917, and is confirmed as such by a reference to official instrumental records. The intensity of the frost in that year was perhaps even greater than in the more recent year with which we are now dealing, but not its duration, and probably the area over which it was felt was less extensive. It is a fact of some importance to note that the total amount of precipitation, either as rain or, and more especially, as snow, during this cold spell was less than the average, and as a result the protection which might have been afforded to vegetation by snow was largely wanting.

"Towards the close of February temperature had again become nearly normal all over the kingdom, but the usual seasonal increase of warmth looked for in March did not occur, and, instead, frosts again became of frequent occurrence, and were at times very severe, the worst occurring in the second week, when the thermometer fell in several districts to below 10° Fahr. in the screen, and at Wisley to 9° Fahr. upon the grass. Again this extreme cold occurred concurrently with a strong north-easterly wind, which locally did great damage in gardens, even to hardy things. At Wisley it was noted that whilst all vegetables suffered very much, 'many kinds looked

as though they had been scorched by fire'; and also that 'much injury was done to trees and shrubs.' At the close of the month (March) 'all vegetation had become extraordinarily late, and with the exception of a few Crocuses scarcely any spring flowers were to be seen, whilst all garden operations had become much delayed by the unseasonable weather'; and this note expresses the general tenor of the remarks in the schedules. In some districts gorse was killed; trees and shrubs were reported to have suffered to a greater extent than with any previous frost, of which a record had been kept; birds, especially thrushes, were killed in large numbers; and at Byfleet (Surrey) 'Globe Artichokes and clipped box were killed outright.' On the other hand, in the Royal Gardens at Kew, whilst 'many hardy plants, like gorse and Arbutus, were badly cut on the north-east side, they were untouched where screened from the wind.' There were other observers who attributed the damage wrought largely to the occurrence of the mild interval between the spells of severe cold, as well as to the effect of the wind; and many remarks lay stress on the prolonged duration of the frost as the chief cause of the damage done.

"It remains to be said that the wintry weather continued well on into April. It therefore covered the exceptionally long period of nearly five months, during the whole of which, with a few brief intervals, it was generally cold, and often extremely so, and very boisterous and disturbed with keen, biting winds.

"In April the temperature over some parts of Scotland again fell to below 10° Fahr., and in all other parts of the kingdom to the neighbourhood of 20° Fahr.—generally a little below that point, and nowhere much above it; and there appears good reason for the verdict that all over the kingdom it was the coldest April on record. Quite in the south of England, at Isleworth, it was described as 'the coldest April for twenty-seven years, and to have had the heaviest snowfall for that month in thirty-four years.' At Totland Bay, Isle of Wight, it was the 'lowest April mean temperature for thirty-one years,' &c. At the beginning of the month at quite a number of places, in Ireland as well as in England and Scotland, the thermometer did not rise to 30° Fahr. at the warmest part of the day; and frosts, more or less severe, occurred every night. But before the close of the month conditions had become greatly improved, and at the commencement of the fourth week maximum temperatures of 60° and upwards were again generally recorded all over the kingdom, and once more climatic conditions had become normal."

* * * * * * * *

The following is a list of the localities from which reports and lists were received, with some particulars concerning their situation and, where available, the minimum temperature recorded.

The portion of each address given in small capitals is the form in which reference is made to that locality in the general list of plants.

Locality.	Height above Sea.	Situation with regard to Shelter, &c.	Lowest Temperature. In Screen.	Lowest Temperature. On Grass.	Records made by
	Feet.				
ABBOTSBURY Castle, Dorset	100	Sheltered by hills and trees, half mile from sea	16	14	Mr. H. Kempshall.
ALDENHAM House, Elstree, Herts	305	Sheltered by hills	3		The Hon. Vicary Gibbs.
ALDERSEY Hall, Cheshire	50	Hills on east	12		Hugh Aldersey, Esq.
ALNWICK Castle, Northumberland	181		8		Mr. W. Thomson.
ASHFORD, Eastwell Park, Kent					Mr. J. E. Weston.
AYLESBURY, Waddesdon, Bucks	650	Open	2	0	Mr. G. F. Johnson.
BEACONSFIELD, Butlers Court, Bucks	350	Sheltered by woods			Mrs. Reckitt.
BETTWS y Coed, Coed Derw, N. Wales	100–150				E. C. Buxton, Esq.
East BERGHOLT, Suffolk	129		16·5	3	Charles Eley, Esq.
BOSAHAN, St. Martin, Cornwall	250	Sea on three sides	26	23	Sir Arthur P. Vivian, Bart.
East BURNHAM Park, Slough, Bucks.	120				Sir Harry J. Veitch.
BYFLEET, West Hall, Surrey	62		(−1)		Mr. G. Carpenter.
CARNARVON, Glynllivon Park, Llanwrda, N. Wales	200	Sea within two miles	10	8	Mr. Peter Williams.
CHATSWORTH, Derbyshire	436		·01		Mr. F. Jennings.
CHIPPING NORTON, Sarsden, Oxon.	530		5		Mr. J. E. Vine.
COBHAM Hall, Cobham, Kent	300	Sheltered by hills			Earl of Darnley.
COLESBORNE, Cheltenham, Glos.	550	Sheltered by trees	(−1 Jan. 5 April 2)		H. J. Elwes, Esq.
CRAWLEY, Tilgate Forest Lodge, Sussex	440	Sheltered by woods		0	Major C. G. A. Nix.
CROWSLEY Park, near Henley-on-Thames, Oxon.	200	Sheltered by trees			Col. Baskerville.
DAWYCK, Scotland	750–800		(zero frosts every winter)		F. R. S. Balfour, Esq.
DORKING, Burford Lodge, Surrey	150		−2		Sir William Lawrence, Bart.
DOWNHAM, Ryston Hall, Suffolk	35	Sheltered by trees	9		E. K. Pratt, Esq.
EDENHALL, Langwathby, Cumberland	380	Pennine Range six miles to east	0		Charles H. Shaw, Esq.
ENFIELD, Myddelton House, Waltham Cross, Herts	111				E. A. Bowles, Esq.
EPPING, Copped Hall, Essex	300		12		Mr. Arthur Bullock.
EXETER, Killerton, Devon	160		10	6	Sir Thomas Dyke Acland, Bart.

FARNBOROUGH, Minley Manor, Hants.	340	Sheltered by trees	3			L. Currie, Esq.
FOTA, Queenstown, Ireland	30			(17)		Lord Barrymore.
GATTON Park, Surrey	440	Sheltered from north	5		2	Sir Jeremiah Colman.
GLASNEVIN, Royal Botanic Gardens, Dublin						Sir Frederick Moore.
GRINSTEAD, Brockhurst, East Grinstead, Sussex	435	Sheltered from north-east	7		3	F. J. Hanbury, Esq.
GUILDFORD, Clandon Park, Surrey	500–600			(0)		Mr. H. W. Blake.
HARGHAM Hall, Attleborough, Norfolk	100	Tree shelter only				Sir Hugh Beevor, Bart.
HARROW-on-the-Hill, Newlands, Middlesex	400	Open				Sir Arthur Hort, Bart.
HAYLING Island, Hants	20			(10)		Col. Sandeman.
HEADFORT House, Co. Meath, Ireland						Mr. W. E. Trevithick.
HEVER Castle, Kent	118–140	Sheltered by hills		6		Mr. H. R. Whitelaw.
HITCHIN, King's Walden, Bury, Herts				7		Mr. F. J. Hartless.
ISLEWORTH, Mandeville House, Middlesex	24	Enclosed by walls and buildings	12			A. Worsley, Esq.
KEW, Royal Gardens, Surrey	only a few feet	Thames on west side	10		6	Sir David Prain, K.C.M.G.
LANARTH, St. Keverne, Cornwall	over 300		23			P. D. Williams, Esq.
LEONARDSLEE, Horsham, Sussex	270	Sheltered from south-west; open to east and north-east	17		9	Sir Edmund Loder, Bart.
LLANDAFF, Hillside, Cardiff	100			9		John E. Williams, Esq.
LUDGVAN Rectory, Long Rock, Cornwall						Rev. Arthur Boscawen.
LYNDHURST, Cuffnells	150–200					R. G. Hargreaves, Esq.
MANGOTSFIELD, Rodway Hill House, Bristol, Glos.	300	Open		7		C. H. Cave, Esq.
MONMOUTH, The Hendre	176			0		Mr. Thomas Coomber.
MONREITH, Whauphill, Wigtownshire, Scotland	120	Open sea 1 mile to south-west and north-west; fresh-water lake quarter mile to north		15		Rt. Hon. Sir Herbert Maxwell, Bart.
NEWBURY, The Court, Yattenden, Newbury, Berks.	450	Sheltered by woods		10		Elizabeth Waterhouse.
NORTHWICH Hall, Cheshire	82	Open to east	4		2	Mr. Alfred N. Jones.
NYMANS, Handcross, Sussex	450	Exposed to east		10		Mr. J. Comber.
OSTERLEY Park, Isleworth, Middlesex	86·5	Open	8			Mr. David Moyes.
OXON includes Aston Rowants	430	Sheltered by trees north side of Chiltern Hills				
OXON includes Watlington Park	800	On top of Chilterns, woods all round			0	Mr. G. Abbey.
OXON includes Howe Combe	500					
POOLEWE, Inverewe, Ross-shire	1–2	Close to sea	13			Osgood H. Mackenzie, Esq.
ROMFORD, Bishop's Hall, Essex	550			15		Lord Lambourne.

Locality.	Height above Sea.	Situation with regard to Shelter, &c.	Lowest Temperature.		Records made by
			In Screen.	On Grass.	
	Feet.				
ROSTREVOR House, Rostrevor, Ireland	sea level to 350, mostly 150	Sheltered by hills and plantations on Carlingford Lough	19	Ap. 10	Sir John Ross of Bladensburg, K.C.B.
SHERBORNE Castle, Dorset	195		20		Mr. J. Turton.
SLOUGH, Royal Nurseries, Bucks	100	Open	1½		Arthur Turner, Esq.
SOUTH MOLTON, Castle Hill, North Devon	317	Hills and woods	11		Mr. E. E. Bristow.
STEVENAGE, Weston Park, Herts	450–470	Rather open	10		M. R. Pryor, Esq.
STOW-on-the-Wold, Abbotswood, Glos.	550	Sheltered by hills and woods	3		Mark Fenwick, Esq.
TAL-Y-CAFN, Bodnant, N. Wales	150	Sheltered by hills to east, 8 miles from sea	9		Hon. Harry McLaren.
TORTWORTH, Falfield, Glos.	264			10	Mr. John Banting.
TREBAH, Falmouth, Cornwall	300	On sea	18		Mrs. Charles Hext.
UCKFIELD, Sheffield Park, Sussex	120		10		Arthur G. Soames, Esq.
WAKEHURST Place, Ardingly, Sussex	350–400		17	7	Gerald W. E. Loder, Esq.
WESTONBIRT, Tetbury, Glos.	400	Open		8	Mr. A. Chapman.
WHITBY, Mulgrave Castle, Yorks	410	On North Sea	7	Ap. 1	Mr. Joseph Corbett.
WISLEY, R.H.S. Gardens, Ripley, Surrey	90–150		5	−4	Mr. S. T. Wright.
WOODBRIDGE, The Nursery, Suffolk	39·3	River Deben, salt water estuary within half mile	11		R. C. Notcutt, Esq.
WYE includes {Olantigh, Oxentown House, Agricultural College, Eastwell} Kent	200				Mr. Bond. Cecil H. Hooper, Esq. H. C. Chapelow, Esq.

List of Plants.

In arranging the names of plants for the following list, I have followed the Kew Hand Lists in any cases of divergence or doubt that have attracted my attention. I cannot, of course, take any responsibility for the correctness of the names as applied to the plants, having merely copied them from the lists. In a few instances I have taken the liberty of altering names when I believe the name generally in use in gardens is not the correct one. For instance, *Berberis Wallichiana* becomes *B. Hookeri*, as the true *B. Wallichiana* is probably not in cultivation. *Crinodendron Hookeri* becomes *Tricuspidaria lanceolata*, and so on.

Signs and Abbreviations.

* Before a name signifies that the plant is of recent introduction, and, unless otherwise stated, in almost all cases from China.

† Following the name of the locality shows that the plant was grown against, or close to, a wall. If any of the letters N., S., E., or W. are added, a wall facing North, South, West, &c. is signified.

When a numeral follows the name of the locality it shows the number of years the plant has been in its present position.

The extent of damage, or escape from injury, is shown by the use of the initial letters of the following words in italics:

K = *Killed.*
G = Cut down to the *Ground* level.
B = *Badly* injured.
S = *Slightly* injured.
U = *Uninjured.*

The names of localities have been shortened when possible to one word. An alphabetical list of these will be found in the table on pp. 402–404, with full addresses and information as to exposure, amount of frost, &c.

Abelia chinensis. B. Aldenham.

A. floribunda. K. Hever 5 ; B. Glasnevin ; S. Exeter 14, Monreith† 12, Trebah 12, Wakehurst† 10.

A. rupestris. K. Oxon ; B. Chipping Norton 6, Wisley ; S. Enfield 10 ; U. Wakehurst.

A. spathulata. U. Leonardslee 6.

A. triflora. U. Aldenham.

**Abies*. All new Chinese, uninjured at Kew 6.

Abies bracteata. K. Dawyck (including one 10 ft. high).

**A. Delavayi*. U. Leonardslee.

**A. Faxoniana*. U. Leonardslee.

A. firma. K. Dawyck.

A. Pindrow. U. Dawyck.

A. Pinsapo. Monmouth (many needles killed).

A. recurvata. U. Leonardslee.

A. religiosa. G. Glasnevin ; U. Wakehurst 2.

A. sachalinensis. U. Dawyck.

A. sibirica. U. Dawyck.

Abutilon megapotamicum. K. Monreith†, Nymans† 7 ; G. Monreith† ; B. Wakehurst† ; U. Monreith.

Abutilon vitifolium. K. Crawley 7, Stow† 2, Wisley 8 ; B. Glasnevin, Mangotsfield 1, Nymans 4 ; S. Enfield 6, Wisley 6, Leonardslee 3, Wakehurst.

Acacia alata. K. Rostrevor.

A. armata. K. Abbotsbury 5 ; S. Rostrevor.

A. Baileyana. K. Abbotsbury 5, Ashford, Nymans† 2, Tal-y-Cafn† 2 ; B. Rostrevor ; S. Trebah 12.

A. calamifolia. K. Headfort, Rostrevor.

A. cultriformis. B. Lanarth 7.

A. cyanophylla. K. Abbotsbury 2.

A. Cyclops. K. Rostrevor.

A. dealbata. K. Aldenham, Nymans† 7 ; G. Exeter 4, Tal-y-Cafn 8 ; B. Enfield, 8 ; S. Lanarth 10 ; U. Fota, Rostrevor.

A. decurrens. U. Rostrevor.

A. Dietrichiana. K. Headfort.

A. eburnea. K. Rostrevor.

A. juniperina. B. Lanarth 6.

A. longifolia. K. Exeter 14, Headfort, Rostrevor.

A. melanoxylon. U. Rostrevor, Wakehurst† 5.

A. neriifolia. B. Rostrevor.

A. pulchella. K. Rostrevor†.

A. pycnantha. K. Abbotsbury 2, Rostrevor.

A. Riceana. S. Exeter†.

A. verticillata. K. Headfort, Rostrevor ; B. Lanarth 6, Rostrevor.

A. Whanii. K. Headfort.

Acantholimon venustum. K. Monreith 6, Stow.

Acanthopanax divaricatum. U. Aldenham.

A. lasiogyne. U. Aldenham.

A. sessiliflorum. U. Aldenham, Enfield 10.

A. 2480 Vilmorin. U. Aldenham.

Acer akurundinense. U. Aldenham.

A. Campbelli. U. Westonbirt.

A. capillipes. K. Bergholt ; S. Aldenham.

A. cappadocicum. S. Aldenham.

A. catalpifolium. S. Glasnevin.

A. circinatum. U. Aldenham.

A. crataegifolium. U. Aldenham.

A. creticum. U. Aldenham.

A. dasycarpum. U. Aldenham.

A. Davidi. K. Dawyck ; U. Aldenham, Enfield 1, Slough, Wakehurst 6.

A. diabolicum. U. Aldenham.

A. discolor. K. and B. Aldenham.

A. erianthum. U. Aldenham, Tortworth, Westonbirt.

A. Forrestii. G. Wisley, 2.

A. fulvescens. U. Aldenham.

A. griseum. U. Aldenham, Westonbirt.

A. Heldreichii. U. Aldenham.

Acer Henryi. K. Dawyck; S. Hargham, Aldenham; U. Westonbirt.
A. Hookeri. B. Rostrevor † N.
A. japonicum. U. Aldenham.
A. lobatum. U. Hargham.
A. Lobelii. U. Aldenham.
A. longipes. S. Glasnevin.
A. Maximowiczii. U. Aldenham, Westonbirt.
A. Miyabei. U. Aldenham, Westonbirt.
A. nikoense. S. Aldenham.
A. oblongum. S. Aldenham.
A. opulifolium. U. Aldenham.
A. pennsylvanicum. U. Aldenham.
A. pictum. U. Aldenham.
A. pictum var. *Mona.* U. Hargham 7.
A. platanoides var. *Schwedleri.* U. Aldenham.
A. rubrum. U. Aldenham.
A. saccharinum. U. Aldenham.
A. sinense. S. Glasnevin.
A. 4100 Forrest. S. Aldenham.
A. 6008 Forrest. K. Aldenham.
Achania mollis. K. Abbotsbury 2.
Achillea Kellereri. K. Enfield 1, Wisley.
A. Obristii. K. Wisley.
Actinidia chinensis. U. Aldenham.
A. venosa. U. Aldenham.
Adenocarpus anagyrus. K. Enfield 7, Llandaff 2.
A. decorticans. U. Enfield.
A. frankenioides. U. Rostrevor.
A. foliolosus. K. Glasnevin.
Aegle sepiaria. U. Aldenham, Aldersey, Enfield, Fota, Nymans 9.
A. × Citrange. U. Fota.
A. × Colman.
A. × Morton. } S. Enfield.
A. × Savage.
Aesculus arguta. S. and U. Aldenham.
A. californica. K. Dawyck; W. Aldenham, Enfield 10.
**A. chinensis.* U. Kew.
A. coriacea. U. Aldenham.
A. discolor mollis. U. Aldenham.
A. flava. U. Aldenham.
A. glabra. U. Aldenham.
A. indica. B. Dawyck; U. Aldenham, Mangotsfield.
A. parviflora. G. Aldersey; U. Aldenham.
**A. Wilsonii.* U. Kew.
Agapanthus Mooreanus. U. Aldersey, Enfield, Isleworth, Wakehurst.
A. umbellatus. K. and B. Isleworth, Lanarth 10; U. Wakehurst 7.

Agapanthus Weillighii. K. and B. Isleworth.
Agave americana. K. Enfield 4, Grinstead 4; B. Nymans 4.
A. × Franzosinii. U. Rostrevor.
A. Parryi. Enfield, U. covered 12; S. open 12.
A. Salmiana. U. Rostrevor.
Agonis flexuosa.
A. marginata. K. Ludgvan.
A. parviceps.
Ailanthus glandulosa. U. Aldenham, K. Dawyck.
A. Duclouxii. S. Aldenham.
A. Giraldii. S. Glasnevin.
A. Vilmoriniana. K. Aldenham (young plants); B. Aldenham 10; S. Glasnevin.
**Alnus cremastogyne.* U. Aldenham, Kew 9, Wakehurst 7.
A. firma. U. Aldenham.
**A. lanata.* U. Kew 9, Aldenham.
A. nitida. U. Aldenham.
A. sitchensis. U. Aldenham.
Aloysia citriodora. K. Ashford, Exeter† 17, Slough 1, Wakehurst 10; G. Colesborne†, Enfield 15, Fota (old plants).
Amaryllis Parkeri. K. Isleworth (bulbs exposed); S. Enfield; U. Isleworth (well covered).
Amelanchier oblongifolia.
A. oxyodon. U. Aldenham.
A. pumila.
Amicia Zygomeris. K. Nymans 3, Wakehurst†.
Ammocharis falcata. U. Isleworth (kept dry).
Amorpha canescens. B. Aldersey 11; U. Aldenham.
A. caroliniana. B. Aldenham.
A. fruticosa. B. Aldersey 11.
A. montana. S. Aldenham.
A. nana.
A. sinensis. U. and S. Aldenham.
**Amphicome arguta.* K. Colesborne, Himalayan var.; K. Enfield, Farrer's var.; U. Colesborne, Farrer's var.
Anchusa italica. K. Hever 1.
Andromeda Polifolia. S. Nymans 3; U. Wakehurst 10.
**Anemone rupicola.* K. Stow (? frost); U. Enfield.
Anopterus glandulosus. K. Abbotsbury 5; U. Ludgvan, Rostrevor.
Anthyllis Barba-Jovis. K., B., and U. Rostrevor; B. Headfort, Wakehurst† old.
A. Hermanniae. K. Enfield 6, Kew 15 (except under walls); B. Glasnevin.
Apera arundinacea. K. Grinstead.
Aphyllanthes monspeliensis. K. Harrow except one plant 4–6; B. Enfield 15; S. Tal-y-Cafn 2 and 5.
Aplopappus ericoides. K. Nymans 2.

Aralia chinensis. } U. Aldenham.
A. chinensis var. *glabrescens.* } U. Aldenham.
A. Maximowiczii. S. Grinstead.
A. pentaphylla. U. Aldenham.
Araucaria excelsa. K. Abbotsbury 2.
Araujia sericifera (syn. *Physianthus albens*). K. Rostrevor†.
Arbutus Andrachne. K. and S. Wakehurst 7; G. Westonbirt 28; B. Stow 4, Wye; S. Lyndhurst 12.
A. canariensis. B. Glasnevin; U. Rostrevor.
A. Croomii. B. Wakehurst.
A. diversifolia. K. Glasnevin.
A. espinosa. U. Rostrevor.
A. furiens. K. Rostrevor, Wakehurst 3.
A. hybrida. G. Colesborne, Westonbirt 38, Kew 30; G. and B. branches on N.E. side; K. and B. Aldenham.
A. Menziesii. K. Lanarth 2, Stow 1; B. Aldenham, Lanarth, Wakehurst, Wisley 17, Wye; S. Uckfield 5; U. Mangotsfield 1.
A. Rollisonii. S. Glasnevin.
A. Unedo. G. Colesborne; S. Molton 6; B. Aldenham, Glasnevin, Wye; S. Aldenham, Aldersey 10, Chipping Norton 6, Leonardslee 40 (injured in 1908), Slough 4, Newbury.
A. Unedo var. × *magnifica.* S. Glasnevin.
Arctostaphylos glauca. K. Dawyck, Uckfield 2.
A. heterophylla. K. Dawyck.
A. Manzanita. K. Uckfield 2.
A. pungens. K. Dawyck (including old plants).
A. Stanfordiana. K. Leonardslee 4.
**Arisaema concinnum.* } U. Colesborne planted deeply in shade.
A. consanguineum. } U. Colesborne planted deeply in shade.
A. curvatum. } U. Colesborne planted deeply in shade.
Aristolochia altissima. S. Rostrevor.
A. heterophylla. U. Aldenham.
A. pubescens. S. Aldenham.
A. Sipho. U. Aldenham.
Aristotelia Macqui. K. Aldenham (young plants), Tortworth 2; B. Aldenham (old plants), Glasnevin; S. Crowsley.
A. racemosa. K. Aldenham, Fota 15; B. Ludgvan; U. Wakehurst 4.
A. tomentosa. B. Leonardslee 5.
Artemisia camphorata. K. Aldenham.
A. tridentata. B. Aldenham; U. Enfield.
Arundinaria anceps. G. Kew 20; B. Aldenham, Bettws; S. Enfield, Slough 5; U. Woodbridge 6.
A. auricoma. U. Aldenham, Enfield.
A. falcata. B. Wakehurst.
A. Falconeri. B. Wakehurst.
A. Hindsii. U. Aldenham.
A. Hookeriana. G. Fota 10–12.

Arundinaria japonica (*Metake*). G. Northwich; B. Colesborne; S. Aldenham, Aylesbury 40, Enfield 20, Slough 2.

A. macrophylla. K. Abbotsbury 1.

A. nitida. G. Oxon; U. Aldenham, Enfield 15, Wisley, Woodbridge.

A. Simoni. G. Aylesbury 10.

A. spathiflora. B. Rostrevor.

Arundo conspicua. K. Aylesbury 30, Grinstead, Wisley; S. Enfield.

Asimina triloba. U. Aldenham.

Astelia Banksii. B. Rostrevor.

**A. nervosa.* U. Monreith.

Artemisia argentea. K. Grinstead.

Astragalus Tragacantha. K. Aldenham.

Astroloma pinifolium. K. Rostrevor.

Athrotaxis cupressoides.
A. laxifolia. } U. Aldenham.

Atraphaxis lanceolata. K. Aldenham.

Atriplex canescens. U. Aldenham.

A. Halimus. K. Enfield, Slough 2; B. Enfield, Glasnevin; S. Hayling Island, 8.

Azalea amoena var. *Hinodigira.* K. Slough 5.

A. indica. K. Grinstead, U. Wisley.

Azara crassifolia. G. Abbotsbury; B. Leonardslee 4.

A. dentata. B. Glasnevin, Wisley 8.

A. Gilliesii. K. Uckfield 3.

A. integrifolia. K. Aldenham, Young; B. Carnarvon 12.

A. microphylla. K. Bergholt 2, Byfleet†; G. Westonbirt 25, Wisley 7–15; B. Aldenham, Glasnevin, Romford 15, Uckfield; S. Chipping Norton 20, Hever 7, Harrow† 4, Leonardslee (B. 1908), Monmouth† W. 26, Stow, Uckfield 7; U. Aldersey† 12.

Azolla caroliniana. K. Aldersey 6.

Baccharis halimifolia. K. Hayling Island 8; U. Aldenham.

B. patagonica. K. Hayling Island 5, Wisley 12; B. Glasnevin; S. Hayling Island; U. Aldenham.

Baillonia juncea. S. Wakehurst; U. Aldenham, Enfield 15.

Bamboos. B. Abbotsbury (recovering); G. and B. Wisley (all except *Arundinaria nitida*).

Bambusa agrestis. S. Aldenham.

Banksia coccinea.
B. grandis. } K. Ludgvan.

B. integrifolia. K. Abbotsbury, Rostrevor (also B.).

B. littoralis. B. Rostrevor.

B. marginata. K. Rostrevor.

B. paludosa. B. Leonardslee† 10.

B. quercifolia. K. Abbotsbury 9.

B. spinulosa. K. Rostrevor.

Beaucarnea longifolia. S. Lanarth.
Berberidopsis corallina. K. Abbotsbury 4, Stow† 5; B. Edenhall† 10, Mangotsfield 3; U. Bosahan, Wakehurst†.
Berberis acanthifolia. U. Enfield 2.
**B. actinacantha.* S. Aldenham, some U.; U. Westonbirt.
B. acuminata. U. Aldenham, Westonbirt.
**B. aggregata.* U. Aldenham, Leonardslee, Westonbirt.
B. × *alksuthiensis.* K., G., and B. Aldenham.
B. Aquifolium. G. Aylesbury 25; B. Enfield, Oxon; S. Aldenham.
B. Aquifolium var. *undulata.* B. Slough 10.
**B. arguta.* K. Rostrevor.
**B. atrocarpa* (*levis*). S. Aldenham, Kew 10. B. Aldenham, Glasnevin.
B. Bealei. U. Aldenham.
B. brachypoda. U. Aldenham.
**B. brevipaniculata.* U. Aldenham, Westonbirt.
B. buxifolia (*dulcis*). S. Aldenham.
B. buxifolia nana. B. Aldenham.
B. canadensis. U. Aldenham.
B. candidula. U. Aldenham, Leonardslee 3, Westonbirt.
**B.* Chinese. U. All at Crawley, all except *atrocarpa* at Kew.
B. Chitria. U. Aldenham.
**B. concinna.* S. Aldenham; U. Westonbirt.
B. congestiflora. B. Crawley; S. Aldenham.
B. Darwinii. K. Aylesbury (also B.) 30; G. Colesborne (also B.), Oxon, Slough 2, Wye; B. Aldenham, Crowsley, Edenhall 10, Enfield, Harrow, Lanarth (exposed to E.), Romford 15, Stow 10, Uckfield (also S.) 7, Tortworth 20, S. Chipping Norton 15; U. Aldersey.
B. diaphana. U. Aldenham, Westonbirt.
**B. dictyophylla.* U. Aldenham, Wakehurst 3, Westonbirt.
B. empetrifolia. U. Aldenham, Westonbirt.
B. Fendleri. U. Aldenham.
B. Fortunei. B. Aldenham.
B. Fremontii. K. Nymans; S. Aldenham, Wakehurst† (old); U. Mangotsfield 5, Rostrevor 7.
**B. Gagnepainii.* B. Colesborne; U. Aldenham, Mangotsfield 3, Slough, Westonbirt.
B. heteropoda. U. Aldenham.
B. Hookeri (*Wallichiana* of Gardens). B. Aldenham, Lanarth 4 Oxon, Wisley 10; U. Slough.
B. ilicifolia. }
B. integerrima. } U. Aldenham.
B. Jamesonii. U. Westonbirt.
B. japonica. G. Westonbirt 25; W. Aldenham, Wisley.
B. Julianae. U. Aldenham.
B. Knightii. B. Aldenham, Harrow, Oxon; S. Crowsley, Stow 10; U. Wakehurst 5, Westonbirt.

**Berberis Koreana*. U. Westonbirt.

B. Maximowiczii. U. Aldenham.

B. Mouillacana. B. Aldenham.

B. nepalensis. B. Aldenham; S. Monreith 6.

B. nervosa. U. Aldenham, Westonbirt.

B. polyantha. U. Aldenham, Slough, Westonbirt.

B. Prattii. U. Aldenham.

B. pruinosa. B. Crawley 6; S. Crowsley, Wakehurst 5; U. Aldenham, Enfield 7.

B. Regeliana. U. Aldenham.

B. repens. U. Aldenham.

B. sanguinea. S. Aldenham; U. Westonbirt.

**B. Sargentiana*. B. Wakehurst 5; S. Glasnevin; U. Aldenham, Enfield 1, Mangotsfield.

B. serrata.
B. sinensis. } U. Aldenham.

**B. Stapfiana*. U. Aldenham, Mangotsfield 2, Stow.

B. stenophylla diversifolia.
B. stenophylla Irvingii. } U. Aldenham, Westonbirt.

B. subcaulialata. G. Colesborne; U. Aldenham, Mangotsfield, Westonbirt.

B. thibetica.
B. Thunbergii.
B. Thunbergii × *vulgaris*. } U. Aldenham.

B. Tischleri. B. Aldenham.

B trifoliata. K. Aldenham; S. Wakehurst† 5.

**B. verruculosa*. U. Aldenham, Enfield 1, Leonardslee 3, Slough 3, Wakehurst 5.

B. virescens. S. and U. Aldenham.

B. Wilsonae. S. Aldenham (others U.), Enfield 2–6; U. Aldersey, Leonardslee 3, Mangotsfield 2, Slough.

**B*. 3394 Vilmorin. S. Aldenham.

**B*. 4039 Vilmorin. U. Aldenham (but one plant B.).

**B*. 7640 Vilmorin. U. Aldenham.

Berchemia racemosa. U. Leonardslee 4.

Betula albosinensis. U. Aldenham.

B. alnoides. K. Dawyck; U. Aldenham.

B. corylifolia.
B. dentata.
B. Ermani.
B. fontinalis.
B. humilis. } U. Aldenham.

B. japonica var. *mandschurica*. U. Aldenham, Leonardslee 6.

B. kenaica.
B. lenta. } U. Aldenham.

B. luminifera. K. Dawyck; U. Aldenham.

B. Medwediewi. U. Leonardslee 4.

Betula occidentalis.
B. papyrifera.
B. populifolia. } U. Aldenham.
B. Potaninii.
B. pumila.

**B. Schmidtii.* U. Aldenham, Leonardslee 2.
B. utilis. U. Aldenham.
Bignonia capreolata. K. Abbotsbury 16.
B. radicans. See Tecoma.
Billardiera fruticosa. U. Rostrevor†.
B. longiflora. B. Poolewe; S. Wakehurst; U. Colesborne†, Rostrevor†.
Boenninghausenia albiflora. K. Monreith 6 (1 plant U.).
Bowkeria Gerrardiana (*triphylla*). K. Rostrevor; G. Nymans 5.
Brachyglottis repanda. K. Bosahan 5; B. Rostrevor.
Brachylaena dentata. K. Rostrevor.
Brachysema lanceolatum. K. Fota† 2.
Brahea Roezlii. B. Fota 3.
Brodiaea volubilis. K. Monreith 1.
Broussonetia papyrifera dissecta. B. Aldenham, Wisley 4.
B. papyrifera cucullata. Less hardy than type, Aldenham.
Brunnichia cirrhosa. S. Wakehurst 2.
Buddleia albiflora. U. Aldenham; B. Wisley 6.
**B. alternifolia* (Farrer 100); U. Enfield 1 and 2, Wisley 1.
B. asiatica. K. Lanarth 6.
B. auriculata. K. Abbotsbury 9; B. Wakehurst 5.
B. Colvilei. B. Headfort; U. Mangotsfield 5, Nymans 3, Wakehurst.
B. globosa. G. Cobham 8, Hitchin 13, Kew; B. Aldenham, Cobham† 8; S. Enfield 7 and 10; U. Nymans 15.
B. japonica. B. Aldenham.
B. Lindleyana. K. Abbotsbury (also B.); B. Aldenham, Nymans 5.
B. variabilis. K. Aldenham (also B.), Exeter 17; G. Monmouth (exposed to E.); B. Oxon 3, Wisley 12; S. Aylesbury 10, Monmouth (exposed to W.); U. Aldersey, Cobham, Nymans.
B. variabilis magnifica. B. Wisley; U. Enfield, Slough.
B. variabilis superba. K. Slough 3.
B. variabilis Veitchii. B. Wisley; U. Cobham (K. 1908–9), Nymans, Slough.
B. variabilis Farrer 424. U. Wisley 1.
Bumelia lycioides. B. Leonardslee 4.
Bupleurum fruticosum. B. Aldenham.
Bursaria Pantonii. U. Rostrevor.
B. spinosa. S. Rostrevor.
Buxus balearica. U. Aldenham.

B. chinensis.
B. Harlandii } U. Aldenham.
B. japonica.

Caesalpinia Gilliesii. K. Abbotsbury 5.

C. japonica. G. Slough 3; S. Aldersey† 5, Lanarth 5, Nymans, Wakehurst 8.

C. tinctoria. K. Abbotsbury 3.

Calandrinia umbellata. K. Rostrevor.

Calceolaria alba. U. Rostrevor (one plant S.).

**C. angustifolia.* K. Grinstead.

C. integrifolia. K. Lanarth (also G.) 10; Glasnevin, Monreith (also G., B., and S.) 4, Rostrevor; G. Abbotsbury; B. Wakehurst 2; U. Rostrevor (some).

C. Sinclairii. K. Wakehurst†; B. Rostrevor.

C. violacea. K. Aldersey† (some G.), Lanarth 8 (some G.), Stow; G. Enfield 15, Monreith† 3, Wakehurst† 2; B. Rostrevor U. Bosahan.

Callicarpa japonica. G. Enfield; S. Glasnevin; U. Aldenham.

**C.* 6894 Vilmorin. K. Aldenham.

Callistemon coccineus. K. Headfort; S. Wakehurst† 3; U. Rostrevor.

C. lanceolatus. K. Headfort; G. Lanarth; U. Rostrevor.

C. rigidus.
C. rugulosus. } U. Rostrevor.

C. salignus. B. Nymans 2; U. Rostrevor.

C. sanguineus.
C. Sieberi. } U. Rostrevor.

C. speciosus. G. Lyndhurst.

Callitris cupressoides. K. Exeter 5.

C. oblonga. B. Wakehurst†; U. Rostrevor.

C. robusta. K. Headfort, Leonardslee† 6; B. Wakehurst†; U. Rostrevor.

C. verrucosa. U. Rostrevor (one K.).

Calluna vulgaris. K. Leonardslee; B. Aldenham, Nymans (var.) 10.

Calycanthus floridus. K. Dawyck.

C. glaucus. B. Aldenham (some S.).

C. occidentalis. B. Aldenham (some S.); U. Enfield.

Calycotome infesta. U. Rostrevor.

C. spinosa. K. Abbotsbury (some), Glasnevin; U. Rostrevor.

**Calystegia macrostegia.* B. Rostrevor†.

Calythrix Sullivanii. U. Ludgvan.

Camellia cuspidata. U. Lanarth, Slough.

C. reticulata. G. Tal-y-Cafn† N.; U. Bosahan; Wakehurst† 3.

C. Sasanqua. K. Crawley 8; S. Lanarth; U. Enfield 7.

C. Thea. S. Lanarth.

Campanula amabilis. K. Wisley.

C. pyramidalis. U. Isleworth.

C. Steveni. K. Wisley.

Cantua dependens. K. Abbotsbury 4; B. Rostrevor†.

Caragana altaica.
C. arborescens. } U. Aldenham.
C. Boisii.

Caragana decorticans. U. Aldenham, Westonbirt.

C. jubata.
C. sibirica. U. Aldenham.
C. tragacanthoides.

Carissa bispinosa. K. Abbotsbury 4.

Carmichaelia australis. K. Headfort, Lanarth; B. Abbotsbury, Wakehurst; S. Glasnevin; U. Fota, Rostrevor.

C. Enysii. U. Rostrevor.

C. flagelliformis. K. and B. Aldenham; S. Nymans, Rostrevor.

C. odorata. K. Glasnevin; U. Rostrevor.

C. Williamsii. B. Ludgvan.

Carpenteria californica. K. Downham; G. Romford 15; B. Crowsley, Dorking 8 (also S.), Enfield 7, Leonardslee 7, Monreith† 8, Oxon, Tortworth 16, Wakehurst (also S.), Grinstead; S. Carnarvon 6, Epping 12, Exeter 17, Glasnevin, Lyndhurst†, Mangotsfield 4, Nymans† 6, Stow†, Wisley; U. Aldersey† 12, Kew.

Carpinus americana.
C. cordata. U. Aldenham.
C. japonica.

C. Maximowiczii. U. Westonbirt.

Carpodetus serratus. K. Abbotsbury; B. Leonardslee 5; U. Rostrevor.

Carya alba.
C. amara.
C. aquatica.
C. caroliniana.
C. cordiformis. U. Aldenham.
C. glabra.
C. laciniosa.
C. microcarpa.
C. porcina.
C. septentrionalis.

Caryopteris Mastacanthus. K. Stevenage 3; B. Aldenham (also S.) Aldersey† 5, 10; U. Enfield 15, Mangotsfield 5.

Cassia bicapsularis. K. Abbotsbury.

C. corymbosa. K. Headfort, Lanarth, Llandaff† 6, Mangotsfield† 2; G. Fota† 15, Nymans† 6; B. Ludgvan; S. Trebah, 16 (lost 4 feet of wood); U. Bosahan.

C. marylandica. K. Abbotsbury 4.

C. tomentosa. K. Abbotsbury 4, Headfort.

Cassinia fulvida. B. Aldenham (some S.), Wisley 6–12; S. Enfield.

C. leptophylla. K. Aldenham, Crawley 4, Wisley 4; B. Abbotsbury; S. Rostrevor; U. Westonbirt, Wisley (seedlings).

C. retorta. U. Rostrevor.

Castanea Duclouxii. U. Aldenham.
C. koraiensis.

Castanopsis chrysophylla. K. and B. Lanarth (small); U. Aldenham, Enfield 17, Mangotsfield 3.

Casuarina Cunninghamiana. K. Rostrevor.
C. distyla. K. Rostrevor.
C. equisetifolia. B. Rostrevor.
C. glauca. K. Headfort, Rostrevor.
C. lepidophloia. K. Rostrevor.
C. quadrangularis. K. Abbotsbury.
C. suberosa. K. Rostrevor.
Catalpa Fargesii. } U. Aldenham.
C. speciosa. }
Ceanothus azureus. K. Carnarvon 6, Farnborough 20, Gatton, Harrow† 9; G. Hargham, Harrow† 9, Hever 7, Oxon; B. Aldenham (also B.), Aldersey, Edenhall 10, S. Molton 6, Wisley 12.
C. dentatus. K. Aldenham, Ashford, Edenhall 4, Kew†, Tortworth, Wakehurst; B. Oxon†; S. Monmouth 25.
C. divaricatus. K. Edenhall 4, Epping 2; B. Headfort; S. Carnarvon† 5.
**C.* Gloire de Versailles. K. Aylesbury† 15, Harrow 8; G. Oxon; B. Woodbridge†; S. Aldenham, Byfleet, Epping 18, Hever 6, Stow† 3, Nymans 10; U. Enfield.
**C.* Marie Simon. B. Farnborough.
C. pallidus. S. Woodbridge.
C. papillosus. K. Wakehurst; B. Lanarth.
C. rigidus. K. Colesborne†, Kew†, Llandaff 1, Mangotsfield 4; B. Lanarth, Romford 6.
C. thyrsiflorus. K. Aldenham (old G. and B.), Bergholt 3, Colesborne†; B. Crawley 9; S. Crowsley, Stow†.
C. thyrsiflorus var. *griseus.* B. Glasnevin.
C. Veitchianus. K. Aylesbury† 15, Hever (also B.) 6, Kew†, Stow, Woodbridge (open); B. Aldenham, Crawley 9, Crowsley, Epping 17, Glasnevin, Headfort, Hever, Hitchin†, Lanarth, Nymans† 8, Romford, Stevenage, Wakehurst, Whitby 3, S. Carnarvon† 5, Mangotsfield† 3, Uckfield 6, Woodbridge†.
C. velutinus (?). U. Hargham† 5.
Cedrela sinensis. U. Tortworth 5.
Cedrus atlantica. Northwich, lost leaves.
Celastrus ngulatus. } U. Aldenham.
C. articulatus. }
**C. latifolius.* U. Aldenham, Burnham.
C. Loeserieri. S. Aldenham.
C. scandens. U. Aldenham.
Celtis Audibertianus. S. Aldenham.
C. Georgiana. B. Aldenham.
C. occidentalis. } S. Aldenham.
C. occidentalis pumila. }
C. scaber. K. Fota 7.
Cephalanthus occidentalis. U. Aldenham.
C. occidentalis var. *angustifolia.* B. Aldenham.

Cephalotaxus drupacea. U. Aldenham.
Ceratonia Siliqua. K. Abbotsbury 15; B. Leonardslee† 3.
**Ceratostigma Willmottianum.* S. Enfield† 2; U. Kew.
Cercidiphyllum japonicum. B. Stevenage; U. Aldenham, Enfield.
**Cercis chinensis.* B. Nymans 2; S. Aldenham, Lanarth; U. Leonardslee 4.
**C. racemosa.* U. Lanarth (15 feet by 8 feet).
Cestrum aurantiacum. K. Abbotsbury; U. Bosahan.
C. elegans. K. Abbotsbury; G. Wakehurst† 7; B. Rostrevor.
C. fasciculatum. B. Headfort; S. Rostrevor.
C. Newellii. K. Abbotsbury, Nymans 6; G. Lanarth (also B.); S. Rostrevor.
C. Parqui. K. Glasnevin; G. Enfield; B. Rostrevor.
C. vespertinum. K. Abbotsbury.
Chamaerops humilis. B. Guildford 20 (thatched), Wakehurst (open), S. Hayling Island 5; U. Bosahan.
Cheiranthus vars. K. and B. Hever.
Chilianthus oleaceus. B. Rostrevor.
Chimonanthus fragrans. B. Crowsley; U. Aldenham, Enfield.
Chionanthus retusus }
C. virginicus. } U. Aldenham.
Choysia ternata. K. Aldersey (older plants S.), Hever 7 (also B.), Stow (old plants); G. Chipping Norton 20, Colesborne, Hitchin 9 (open to N.), Romford, South Molton, Wye; B. Aldenham (also S.), Glasnevin, Headfort, Hever, Hitchin 5 (open to S.), Oxon; S. Aldersey (old plants), Burnham 10, Enfield 20, Hayling Island 8, Mangotsfield† 5, Monmouth 7, Nymans 6, Slough 2, Uckfield 7.
Chrysanthemum nipponicum. K. Grinstead.
Cineraria Heritieri. K. Rostrevor (others U.),
C. maritima. B. Grinstead.
Cinnamomum Camphora. U. Rostrevor.
C. officinarum. K. Rostrevor.
Cistus. K. Bettws (a few old plants), Colesborne (nearly all species), Gatton (most), Grinstead (many), Kew (all except *laurifolius*, *cyprius*, *Corbariensis*, and *Loreti*), Wakehurst (except *cyprius*, *ladaniferus*, and *purpureus*).
C. albidus. K. Headfort, Stevenage 10, Wisley 5.
C. corbariensis. K. Aldenham (also B.), Tortworth 3; B. Wisley, Enfield; S. Kew.
C. cyprius. B. Aldersey 6 (also S.), Lanarth; S. Kew, Woodbridge 6; U. Woodbridge 1 and 2.
C. florentinus. K. Aldenham, Aldersey, Enfield, Harrow 4 (one plant B.), Nymans 6, South Molton 5, Slough 2; G. Lyndhurst 10, Oxon; B. Epping, Stow 5, Wisley 1–9.
C. hirsutus. K. Aldenham, Enfield.
C. ladaniferus. K. Aldersey, Wisley 1–10; B. Aldenham, Dorking 10; U. Wisley (small plants in pots).

Cistus ladaniferus var. *immaculatus*. K. Tal-y-Cafn.
C. laurifolius. B. Aldenham (also S.) ; U. Aldersey†, Enfield, Kew, Mangotsfield 5, Stevenage.
C. Loreti. K. Abbotsbury, Carnarvon, Harrow 3, Monreith 4 (also U.) ; S. Kew.
C. lusitanicus. K. Aldenham, Enfield 10, Sherborne 7, Slough 2, Wisley 6.
C. monspeliensis. K. Aldenham, Enfield 12 ; B. Wisley 5.
C. platysepalus. K. Aldenham.
C. purpureus. K. Abbotsbury, Aldenham (also B.), Aldersey, Bergholt (young plants), Enfield 6, Epping 2–6, Harrow 8, Hitchin 3, Mangotsfield 2, Monreith 2 (also U.), Nymans 6, Slough 2, South Molton 5, Tal-y-Cafn ; Woodbridge 1 and 2.
C. salvifolius. K. Carnarvon, Epping, Headfort, Sherborne 7 ; B. Wisley 5.
C. vaginatus. K. Rostrevor.
C. villosus. K. Aldersey, Bergholt 8, Carnarvon, Headfort, Nymans 6, Wisley 10.
Citharexylum Bessonianum. K. Nymans 5 ; B. Abbotsbury, Glasnevin ; U. Rostrevor.
C. reticulatum. S. Rostrevor.
Cladrastis amurensis.
C. tinctoria. } U. Aldenham.
Clematis Armandi. G. Epping 5, Llandaff 1 ; U. Aldenham, Enfield 7, Westonbirt.
C. cirrhosa. K. Glasnevin ; S. Enfield.
C. coccinea. U. Aldenham.
C. Delavayi. K. Dawyck.
C. grandidentata.
C. Gouriana.
C. grata. } U. Aldenham.
C. indivisa lobata. U. Rostrevor.
**C. Jouiniana*. U. Aldenham, Enfield 10.
C. macrophylla. U. Aldenham.
C. montana. K. Northwich 10.
C. orientalis tangutica. U. Aldenham.
**C. orientalis obtusiuscula* Farrer 342. K. Bergholt (30 plants, 2 years); U. Enfield 2, Wisley 1.
C. Poroliniana. K. in open Kew ; U. on walls.
C. uncinata.
C. veratrifolia.
C. Walteri.
C. 848 Purdom. } U. Aldenham.
C. 11307 Forrest. K. Aldenham.
Clerodendron Fargesii. U. Aldenham.
C. mandarinorum 425 Wilson. K. Aldenham.
C. trichotomum. S. Aldenham (also U.) ; S. Hayling Island 4, Slough, 3, Wisley 12 : U. Wisley 12.

Clethra arborea. K. Leonardslee† 5; G. Abbotsbury; B. Rostrevor.
Clianthus puniceus. K. Abbotsbury, Llandaff 7 (matted), Wisley; Leonardslee† 7, Headfort, Rostrevor (also B.), Wakehurst† 4; G. Enfield†, Monreith† 3 (also B.); B. Fota† 5 (old).
Cocculus variabilis. U. Aldenham, Enfield.
**Cocos Yatay* (Reg. Argent). U. Fota.
**Codonopsis Bulleyana*. U. Wisley 3.
Colletia cruciata. K. Carnarvon 4; G. Leonardslee 20, Wisley 6; B. Aldenham, Enfield 7, Mangotsfield 1; S. Nymans 6, Uckfield 8.
C. infausta (*spinosa* of gardens). K. Grinstead, S. Aldenham; U. Enfield.
Colquhounia vestita. U. Rostrevor.
Colutea cruenta. U. Aldenham, Enfield.
C. media. U. Aldenham.
C. melanocalyx. U. Aldenham, Enfield.
C. pygmaea. U. Aldenham.
Convolvulus Cneorum. K. Aldenham, Dorking 3, Enfield 6, Glasnevin, Mangotsfield, Monreith 4 (1 plant U.), Nymans 6, Tal-y-Cafn (also B.); G. Wisley; S. Grinstead, Wakehurst† 4.
Coprosma Cunninghamii. U. Rostrevor.
C. lucida. K. Glasnevin, Enfield 1; B. Leonardslee 4; U. Rostrevor.
C. Petriei. U. Enfield 9, Rostrevor.
C. propinqua. S. Aldenham; U. Enfield 5; Rostrevor.
C. robusta. S. Nymans 4.
C. tenuicaulis. B. Abbotsbury.
Cordyline australis. K. Crowsley, Glasnevin (also G.), Lanarth (young plants), Headfort, Uckfield (also G., B., and S.) 7, Wakehurst 7, Wisley 7; G. Ashford, Enfield 8, Nymans 4; S Lanarth; U. Bosahan.
C. Banksii. K. Crowsley 9.
C. indivisa. K. Lanarth (S. in shelter); S. Glasnevin.
C. lentiginosa. K. Glasnevin.
Cordyline × Van Groot (*Doucettii* × *indivisa*). K. Rostrevor.
Coriaria angustissima. S. Aldenham.
C. japonica. K. Slough 4; U. Aldenham.
C. myrtifolia. U. Aldenham.
C. sinica. S. Aldenham.
C. terminalis. U. Aldenham, Enfield.
Cornus alternifolia. U. Aldenham.
C. capitata. K. Aldersey †, Ashford, Hayling Island (one plant), Sherborne 12, Wakehurst (also B.), Wye; G. Wisley 6; B. Crawley 9, Exeter 14, Glasnevin; S. Hayling Island 8, Leonardslee† 12 (injured 1908–9); U. Nymans.
C. controversa. U. Aldenham, Leonardslee 5.
C. fastigiata. B. Aldenham.
C. florida. U. Aldenham.
C. Kousa. K. Stevenage; U. Aldenham.

Cornus Nuttallii.
C. paniculata.
C. paucinervis.
C. poliophylla. } U. Aldenham.

C. Wilsonii. S. Wakehurst.

Corokia buddleioides. G. Lanarth; B. Grinstead, Lanarth, Wakehurst†; U. Ludgvan.

C. Cotoneaster. B. Glasnevin, Wisley 6; S. Aldenham, Llandaff; U. Enfield 10, Leonardslee 10, Ludgvan, Mangotsfield 5, Nymans, Rostrevor.

C. macrocarpa. B. Nymans 5; U. Ludgvan, Rostrevor.

C. virgata. G. Wakehurst 4; B. Aldenham; S. Monreith 2; U. Rostrevor.

Coronilla glauca. K. Headfort, Mangotsfield† 3; S. Grinstead, Lanarth.

C. valentina. K. Abbotsbury, Headfort, Llandaff 2.

Correa alba. K. Carnarvon 2, Rostrevor.

C. magnifica. K. Enfield† 7, Glasnevin, Rostrevor.

C. speciosa. K. Glasnevin, Lanarth.

Cortaderia argentea. K. Hitchin 22 (exposed), Oxon (also G.); G. Tortworth 30; B. Aldersey 6; S. Hitchin (sheltered, west aspect), 6.

Corydalis thalictrifolia. K. Wisley.

C. Wilsonii. U. Wisley.

**Corylopsis platypetala.* U. Kew.

C. spicata. B. also S. Aldenham.

**C. Veitchiana.* U. Kew.

**C. Willmottiae.* U. Kew.

Corylus Colurna.
C. sinensis. } U. Aldenham.

Corynocarpus laevigatus. K. Headfort.

**Cotoneaster.* All new Chinese. U. Kew.

C. acuminata. U. Aldenham, Westonbirt.

C. acutifolia. U. and S. Aldenham.

C. adpressa. U. Aldenham.

C. amoena. U. Burnham; S. Aldenham.

C. bacillaris. U. Aldenham.

C. bullata. U. Aldenham, Burnham, Westonbirt.

C. congesta. U. Aldenham.

C. Dammeri.
C. Dammeri var. *radicans.* } U. Aldenham.

C. Dielsiana. U. Aldenham, Leonardslee 6, Westonbirt.

C. Dielsiana var. *elegans.* U. Westonbirt.

C. divaricata. U. Aldenham.

C. frigida. S. Aldenham; U. Enfield.

C. Harroviana. U. Burnham.

C. Henryana. U. Aldenham.

**C. horizontalis perpusilla.* B. Aldenham (less hardy than type).

Cotoneaster hupehensis. U. Westonbirt.
C. integerrimus. S. Aldenham.
C. laxiflora. U. Aldenham.
C. multiflora. U. Aldenham, Enfield.
C. newryensis. U. Aldenham.
C. pannosa. B. Aldenham ; U. Burnham.
C. racemiflora var. *Meyeri.* U. Aldenham.
**C. salicifolia* var. *floccosa.* U. Aldenham ; Enfield.
**C. salicifolia* var. *rugosa.* K. Dawyck ; S. Aldenham ; U. Burnham, Enfield.
**C. Sargentii.* U. Westonbirt.
C. thymifolia. S. Nymans, Enfield.
C. uniflora. }
C. villosula. } U. Aldenham.
C. Zabelii. S. Aldenham.
**C.* 5567 Forrest. }
**C.* 5570 Forrest. } U. Aldenham.
**C.* 10419 Forrest. B. Aldenham.
**C.* 4414 *Vilmorin.* U. Aldenham.
Cotyledon agavoides. U. Rostrevor.
C. farinosa. S. Enfield (covered) ; U. Rostrevor.
C. roseata. U. Rostrevor.
Crassula sarcocaulis. K. Harrow 4 ; S. Enfield (covered).
Crataegus apiifolia. S. Aldenham.
C. Azarolus.
C. Carrieri.
C. chlorosarca.
C. cuneata.
C. Dippeliana.
C. dsungarica.
C. Korolkowi. } U. Aldenham.
C. melanocarpa.
C. orientalis.
C. pinnatifida.
C. saligna.
C. tanacetifolia.
C. uniflora. }
C. uniqua. } S. Aldenham.
C. viridis. }

All the numerous forms of Crataegus from N. America, except one or two, such as *C. apiifolia* and *C. spathuluta,* whose habitat is the Southern U.S.A., uninjured at Aldenham.

Crataego-Mespilus Dardari. }
C.-Mespilus Asnièresii. } U. Aldenham.
Crinum giganteum. K. Isleworth.
C. Johnstonii. S. Dorking.
C. longifolium. U. Isleworth, Enfield.

Crinum Moorei. K. Dorking (others G.), Isleworth; S. Enfield (covered with fir boughs).

C. Powellii. B. Guildford 8; S. Dorking (started 2 months late); U. Enfield 7 and 10, Isleworth.

C. Worsleyi and others. K. Isleworth.

C. yemense.
C. yuccaeoides. } U. Isleworth.

Crossosoma californicum. B. Rostrevor.

Cryptomeria japonica. U. Aldenham.

Cudrania triloba. U. and S. Aldenham.

Cunninghamia lanceolata. S. Aldenham; U. Rostrevor.

Cupressus bermudiana. K. Headfort.

C. cashmiriana. K. Glasnevin; S. Nymans 10; U. Rostrevor (one S.).

C. Duclouxiana. S. Aldenham.

C. formosensis. K. Aldenham (also B.); Kew (also G., B., and S.) 4, Tortworth 3; B. Wakehurst† 2; S. Headfort.

C. funebris. K. Aldenham (also B.), Carnarvon (young plants; older 25 years, 15 to 20 ft. B.); B. Glasnevin; S. Wakehurst 2.

C. Goveniana.
C. horizontalis. } U. Aldenham.

C. Lawsoniana. B. Aldenham (exposed to E., otherwise S.), Northwich 35, S. Molton.

C. lusitanica. K. Nymans 18; B. Bosahan 4, Colesborne 5, Glasnevin, Nymans 19, Uckfield.

C. lusitanica var. *Benthamii.* B. Glasnevin, Leonardslee 6; S. Headfort, Uckfield 7, Wakehurst.

C. Macnabiana. K. Nymans 16; S. Headfort.

C. macrocarpa. K. Chipping Norton 10, Colesborne 10; B. Chipping Norton (very old), Exeter 6 (side exposed to E. killed back); S. Aldenham.

C. macrocarpa var. *compacta.* B. and S. Uckfield 7.

C. macrocarpa var. *lutea.* U. Aldenham, Enfield.

C. nootkatensis. U. Aldenham.

C. sempervirens. K. Carnarvon 6, Colesborne 6; U. Enfield 3 and 20.

C. torulosa. B. Glasnevin; S. Wakehurst.

Cyathodes robusta. U. Rostrevor.

Cydonia cathayensis. U. Aldenham, Enfield.

C. japonica Wilsonii. K. Dawyck; S. Aldenham; U. Westonbirt.

C. sinensis. K. Glasnevin; S. Aldenham.

Cyrilla racemiflora. B. Nymans 6; Wisley 1.

Cyrtanthus Macowanii. U. Isleworth (kept dry).

Cytisus aeolicus.
C. albus durus. } K. Aldenham.

C. austriacus. U.
C. biflorus. U.
C. capitatus. S.
C. decumbens. B. and S. } Aldenham.

Cytisus filipes. K. Headfort, Rostrevor.
C. fragrans. K. Nymans 3.
C. leucanthus. B. Aldersey 10 ; U. Aldenham.
C. linifolius. K. Headfort, Rostrevor.
C. nigricans. U. Aldenham, Enfield, Wisley.
C. praecox. K., B., and S. Molton 9.
C. proliferus. B. Rostrevor ; U. Lanarth 10.
C. purpureus. G. Aldersey 5, Lanarth (also B.) ; U. Aldenham.
C. racemosus. U. Rostrevor.
C. sessilifolius. U. Aldenham, Enfield.
C. Scoparius. B. Cobham ; S. Aldenham.
C. versicolor. U. Aldenham, Enfield, Wisley.
C. virgatus. U. Aldenham, Enfield.

Daboecia polifolia. K. Kew (old plants, others B. and S.) ; G. Farnborough 10, Glasnevin ; B. Crowsley, Enfield, Lanarth (if exposed to E.), Stow ; S. Nymans 15.
Dacrydium Bidwillii. S. Wakehurst 1.
D. Colensoi. U. Rostrevor.
D. cupressinum. K. Headfort, Nymans 2 ; U. Rostrevor.
D. Franklinii. U. Rostrevor.
Dais cotinifolia. B. Rostrevor.
Damnacanthus indicus. S. Llandaff 2 ; U. Rostrevor.
Daphne Blagayana. K. Wakehurst ; U. Aldenham.
D. Cneorum. U. Aldenham, Aldersey.
D. Cneorum var. *major.* K. Burnham 2.
D. Giraldii. U. Wakehurst 3.
D. odora. K. Wisley ; S. Enfield† 4.
D. pontica. U. Aldenham, Enfield 8.
D. retusa. U. Enfield 6, Wakehurst.
Daphniphyllum humile. U. Aldenham.
D. macropodium. K. Dawyck ; S. Enfield ; U. Aldenham.
**Davidia involucrata.* K. (nearly all) Dawyck ; U. Aldenham, Burnham, Leonardslee 8, Wakehurst 10, Westonbirt.
D. laeta. U. Wakehurst 3.
**Decaisnea Fargesii.* U. Aldenham, Burnham, Enfield 8, Mangotsfield 2, Stow, Tortworth 4, Wakehurst 6, Westonbirt.
**Deinanthe coerulea.* U. Enfield, Monreith, Rostrevor.
Dendromecon rigidum. K. Lanarth† 14, Rostrevor†, Wakehurst† ; G. Leonardslee† 9.
Dendropanax japonica. U. Rostrevor.
Desfontainia spinosa. K. Dawyck, South Molton 4, Stow 3 ; B. Uckfield 7 ; S. Wakehurst (also U.) ; U. Nymans.
Desmodium tiliaefolium. G. Stow ; B. Enfield 15, Glasnevin.
Deutzia corymbosa }
D. crenata. } U. Aldenham.
D. discolor. S. Aldenham.
D. gracilis. U. Aldenham.

Deutzia longifolia. U. Aldenham, Westonbirt.
D. mollis. U. Aldenham.
D. scabra. B. Aldenham; S. Glasnevin; U. Westonbirt.
D. Vilmoriniae. U. Burnham.
D. Wilsonii. U. Westonbirt.
Dianella coerulea. G. Enfield 6; U. Rostrevor.
D. tasmanica. K. Aldenham; U. Rostrevor.
Dianthus arboreus. K. Enfield, Kew.
D. fruticosus. K. Enfield, Kew.
Dicksonia antarctica. K. Nymans 6; B. Lanarth 12; U. Rostrevor.
Dichroa febrifuga. K. Glasnevin.
Dierama pulcherrimum. K. and B. Aldersey 4; B. Enfield 2–8.
Diervilla florida. U. Aldenham.
Diosma ericoides. K. Fota 3, Hayling Island 8, Rostrevor†.
**Diospyros Lotus* (W. 441). S. and U. Aldenham; U. Hargham.
D. virginiana. S. Aldenham (small plants K.).
Dipelta floribunda. U. Aldenham.
D. ventricosa. U. Aldenham, Barnham.
Diplarrhena Moraea. B. Rostrevor.
Diplopappus fonticola. K. Abbotsbury.
Dipteronia sinensis. S. Aldenham; U. Wakehurst 6.
Dirca palustris. U. Aldenham.
Dodonaea tenuifolia. K. Headfort.
D. viscosa. K. Rostrevor.
Dorycnium hirsutum. K. Glasnevin.
D. latifolium. K. Crawley 4.
Douglasia praetutiana? K. Harrow 4, Wisley.
Dracophyllum arboreum. U. Ludgvan.
Drimys aromatica. K. Enfield 1; U. Bosahan, Crowsley, Wakehurst.
D. colorata. U. Rostrevor.
D. Winteri. K. Dawyck, Exeter (young plants), Stow; G. Enfield 1; B. Aldenham, Crowsley, Llandaff 2, Wakehurst; S. Glasnevin, Uckfield; U. Bosahan.
Dryandra formosa. U. Rostrevor†.
Dyckia rariflora. K. Isleworth.

Eccremocarpus scaber. B. Wakehurst†; S. Enfield†.
Edgeworthia chrysantha. K. Wakehurst† 6.
Ehretia serrata. K. Carnarvon 3; B. Abbotsbury, Wakehurst†.
Elaeagnus angustifolia. U. Enfield.
E. argentea. U. Aldenham.
E. macrophylla. B. Wakehurst† 1; U. Aldenham.
E. multiflora. A. Aldenham, Enfield, Leonardslee 6.
E. pungens. } U. Aldenham.
E. umbellata. }
Eleutherococcus Henryi. U. Aldenham.

Elscholtzia Stauntonii. S. Aldenham.

Embothrium coccineum. B. Glasnevin, Tal-y-Cafn † (old plants) 10; S. Lanarth, Tal-y-Cafn† 4, Wakehurst (also U.); U. Bosahan 15, Fota, Poolewe, Rostrevor, Wakehurst, Westonbirt.

Enkianthus campanulatus. U. Aldenham.

E. japonicus. K. Stevenage (also B.); U. Aldenham; Mangotsfield 3; Westonbirt.

Ephedra altissima. K. Carnarvon; S. Enfield 6; U. Rostrevor.

E. Gerardiana. U. Aldenham.

Erica arborea. B. Glasnevin; U. Aldenham.

E. arborea var. *alpina.* U. Enfield.

E. australis. K. and B. Kew 20; U. Stow 4; Wakehurst.

E. cerinthoides. B. Rostrevor.

E. codonodes (*lusitanica*). G. Wisley, 4–9; B. Crowsley, Kew (also S.); S. Glasnevin; U. Nymans; Wakehurst.

E. Maweana. K. and B. Kew 10; U. Aldenham.

E. mediterranea. B. Aldenham (also U.); B. Crowsley, Glasnevin (compact forms S.); S. Enfield.

E. melanthera. K. Trebah.

E. scoparia. B. Glasnevin; U. Enfield 20.

**E. Veitchii.* K. Kew old plants (also B.), Mangotsfield 3, Stow 4; G. Wisley 2–9; B. Glasnevin, Enfield 9.

Erinacea pungens. K. Harrow 1; S. Enfield 6; U. Aldenham.

Eriobotrya japonica. K. Cobham (sheltered) (U. exposed); B. Wakehurst† (also S.); S. Enfield.

E. prionophylla. Aldenham (K. and B. open; U. on wall).

Eryngium Lassauxii. K. and G. Enfield 15; G. Wisley 10.

Erythrina Crista-galli. K. Crowsley; Enfield 3 and 4.

Escallonia × exoniensis. B. South Molton 6; S. Aylesbury† 5; Monreith 6.

E. floribunda (montevidensis). G. Glasnevin; B. Colesborne†, Enfield† 7, Fota, Headfort, Nymans 4, Stevenage 4; S. Wakehurst†.

E. illinita. G. Glasnevin; B. Kew 30.

E. × langleyensis. K. Oxon†; B. Wisley 5; S. Aldenham, Enfield, Lanarth; U. Aldersey, Stow, Tortworth, Westonbirt† N.

E. macrantha. K. Aylesbury† (also B.) 20, Exeter (also S.); G. Chipping Norton 16, Wisley 9; B. Aldenham, Downham†, Headfort, Leonardslee 15, Oxon, Monmouth† W. 20, S. Molton, Tortworth 12; S. Hever, Sherborne 16, Stow, Wakehurst† (and open); U. Nymans.

E. organensis. K. Abbotsbury, Crawley 4, Leonardslee 5, Nymans 6, Wakehurst† 4; B. Aldenham, Glasnevin.

E. Philippiana. B. Aldenham; U. Enfield.

E. pterocladon. G. Wisley 8; B. Crawley 5.

E. pulverulenta. B. Enfield†, Glasnevin.

E. resinosa. B. Aldenham.

E. revoluta. G. Glasnevin.

Escallonia rubra. B. Glasnevin.
E. viscosa. B. Glasnevin, Kew 30.
Eucalyptus all species. K. Crawley; S. Abbotsbury.
E. acervula. S. Rostrevor.
E. alpina. K. Rostrevor.
E. amygdalina. K. Headfort, Leonardslee, Wakehurst†; U. Rostrevor.
E. Beauchampiana. K. Leonardslee 4.
E. cinerea. K. Enfield (also B.); U. Rostrevor.
E. citriodora. G. Glasnevin.
E. coccifera. K. Hargham 6 (slight shelter); G. Dorking 12, Hargham 7 (sheltered); B. Stow; S. Glasnevin, Wakehurst; U. Enfield 8, Rostrevor.
E. cordata. K. Headfort, Leonardslee 4; B. Enfield 10; U. Rostrevor.
E. coriacea. K. Headfort; B. Wakehurst.
E. delegatensis. K. Rostrevor.
E. ficifolia. K. Abbotsbury.
E. Globulus. K. Downham, Leonardslee 4, Osterley, Sherborne 11, Slough 3, Wakehurst; G. Ashford (1 ft. diameter), Enfield 1; U. Bosahan (80 ft. high), Rostrevor.
E. Gunnii. K. Aldenham (also B.), Aldersey (also S.) 5, Hayling Island 6; G. Colesborne 10; B. Carnarvon 50, Glasnevin, Hargham (cut to stem, shot in May), Exeter 16; S. Lanarth 14, Wakehurst, Whitby 18; U. Enfield.
E. haemastoma. U. Rostrevor.
E. leucoxylon. B. Rostrevor.
E. Macarthuri. K. Wakehurst; U. Rostrevor.
E. Maidenii. K. Kew 5; U. Rostrevor.
E. Muelleri. K. Headfort; U. Rostrevor; Wakehurst.
E. obliqua. S. Rostrevor (one K.); U. Enfield 3; Uckfield.
E. paniculata. K. Glasnevin.
E. pauciflora. U. Rostrevor.
E. pulverulenta. K. Enfield 6, Lanarth 10 (also B.); S. Isleworth 8.
E. resinifera. G. Glasnevin; B. Rostrevor.
E. rubida. K. Glasnevin, Wakehurst.
E. Smithii. K. Glasnevin.
E. stellulata. U. Rostrevor.
E. Stuartiana. K. Hargham 6, Kew 5; G. Glasnevin; B. Enfield 10.
E. urnigera. K. Hargham 5, Hayling Island 6 (and B.), Headfort (two plants U.); G. Tortworth 7; S. Glasnevin, Enfield, Lanarth 10, Leonardslee 5 (injured in 1908), Lyndhurst 6, Wakehurst; U. Rostrevor.
E. vernicosa. U. Enfield; Rostrevor, Uckfield, Wakehurst.
E. viminalis. K. Headfort, Leonardslee 5; G. Glasnevin (also B.).
E. whittingehamensis. K. Aldenham (also B.); G. Colesborne 10; S. Enfield 12, Glasnevin, Kew 20; U. Wakehurst 12.

**Eucommia ulmoides.* U. Aldenham, Enfield 8, Leonardslee 6, Wakehurst 8, Wisley 9.

Eucryphia Billardieri. U. Rostrevor.

E. cordifolia. K. Aldenham, Crowsley, Enfield 1, Lanarth 2 (also S. 12), Uckfield 1; B. Crawley 5, Glasnevin, Kew 6, Nymans 8; S. Tal-y-Cafn† (10 plants) 2–10, Nymans 8; U. Ludgvan.

E. pinnatifolia. G. Dorking; S. Wisley 15; U. Aldenham, Aldersey, Enfield 16, Wakehurst, Westonbirt.

Eugenia myrtifolia. B. Abbotsbury; U. Rostrevor.

Euonymus alatus.
E. americanus.
E. Bungeanus. } U. Aldenham.
E. europaeus var. *atropurpureus*

E. fimbriatus. S. Wakehurst 1.

E. Hamiltonianus. G. Glasnevin; S. and U. Aldenham.

E. laciniatus.
E. lancifolius.
E. latifolius.
E. nanus. } U. Aldenham.
E. odoratus.
E. planipes.
E. radicans.

E. radicans var. *microphylla.* B. Aldenham.

E. sachalinensis.
E. Sieboldianus. } U. Aldenham.
E. verrucosus.

**E. Wilsonii.* U. Aldenham, Kew.

E. yedoensis. U. Aldenham.

Eupatorium deltoideum. B. Rostrevor (recovered rapidly).

E. Purpusii. B. Rostrevor (slow recovery).

E. Weinmannianum. K. Wakehurst 4; G. Enfield 7, Glasnevin, Nymans 4; S. Rostrevor.

Euphorbia biglandulosa. K. Aldersey 1; B. Enfield 10, Rostrevor.

E. dendroides. K. Grinstead.

E. mellifera. G. Enfield 10, Glasnevin; S. Rostrevor.

E. Wulfenii. K. Aldersey (also B.) 2–6, Enfield, Gatton 7, Mangotsfield 4, Slough 7; B. Aldenham, Harrow (also S.).

Euptelea Davidiana. U. Aldenham, Colesborne, Tortworth 5, Wakehurst.

E. Franchetii. S. Aldenham; U. Wakehurst.

E. polyandra. U. Aldenham.

Eurya chinensis. U. Aldenham.

E. japonica. S. Aldenham.

E. latifolia. K. Abbotsbury.

Evodia Baudouini. G. Glasnevin.

E. hupehensis. U. Aldenham.

Evodia P. 321. K. Dawyck.
Exochorda Alberti. ⎫
E. dentata. ⎬ U. Aldenham.
E. Giraldii. ⎪
E. grandiflora. ⎭

Fabiana imbricata. K. Aldenham, Enfield (also B.) 2, Glasnevin (in shade), Guildford 10, Hever 4, Mangotsfield 3, Monreith 2, Sherborne 15, Stow, Tortworth 2, Wisley 6; B. Wakehurst; S. Exeter; U. Glasnevin (in sun), Nymans.
Fagus asiatica. ⎫
F. Engleriana. ⎭ U. Aldenham.
F. fusca. B. Ludgvan.
F. japonica. ⎫
F. lucida. ⎬ U. Aldenham.
F. orientalis. ⎪
F. Sieboldii. ⎭
Fatsia japonica. U. Aldenham.
Feijoa Sellowiana. G. Guildford 10, Wisley 4; B. Enfield 7, Lanarth 12, Wakehurst†; S. Fota 7; U. Rostrevor†.
Fendlera rupicola. K. Wisley; U. Enfield, Wakehurst†.
Fig. B. Downham 20, Glasnevin, Oxon†; S. Slough 1–4.
Fontanesia phyllyraeoides. B. Aldenham.
Forestiera acuminata. K. Aldenham.
**Fortunearia sinensis.* U. Kew (open).
Fothergilla alnifolia. ⎫
F. caroliniana. ⎪
F. major. ⎬ U. Aldenham.
Fraxinus americana. ⎪
F. anomala. ⎭
F. bracteata. S. 5 ⎫
F. chinensis. U. 1 ⎭ Wakehurst.
F. dimorpha. ⎫
F. longicuspis. ⎪
F. mandschurica. ⎪
F. Mariesii. ⎬ U. Aldenham.
F. oregona. ⎪
F. Ornus. ⎭
**F. Paxiana.* U. Aldenham, Colesborne, Kew.
F. pennsylvanica. ⎫
F. potamophila. ⎪
F. quadrangulata. ⎪
F. rhynchophylla. ⎪
F. Sieboldiana. ⎬ U. Aldenham.
F. Späthiana. ⎪
F. texana. ⎪
F. viridis. ⎭

*_Fraxinus_ 206. Purdom. } U. Aldenham.
*_F_. 809. Purdom. } U. Aldenham.
*_F_. 1392. Wilson. S. Aldenham.
Fremontia californica. K. Abbotsbury, Enfield 3, Epping 8, Wakehurst† 7 (also U.); G. Woodbridge (open); B. Crawley 8; S. Llandaff† 1, Mangotsfield† 4; U. Rostrevor, Woodbridge† S. 2–3.
Fuchsia Colensoi. U. Wakehurst 3.
F. corymbosa. K. Nymans 2.
F. excorticata. B. Nymans 5.
F. exoniensis. K. Aldenham.
F. exoniensis var. _corallina_. K. and G. Aldenham.
F. fulgens. K. Glasnevin.
F. gracilis. K. Oxon (also G.); G. Hever 5, Slough 2.
microphylla. K. Wakehurst (also G.†) 2; U. Bosahan.
F. pumila. K. Harrow 1; G. Enfield 15.
F. reflexa. K. Aldenham (also G.).
F. Riccartonii. G. Glasnevin, Hever 5, Slough 2; S. Aldenham, Nymans 20, Wakehurst.
F. Riccartonii fol. var. K. Harrow, G. Enfield.

Garrya elliptica. B. Aldersey† S. 9; B. Aylesbury 40, Lanarth 10, Glasnevin, Oxon; S. Edenhall 23, Enfield 15, Monmouth 25; U. Wakehurst.
G. Thurettii. B. Kew 10; U. Wakehurst.
Gaultheria fragrantissima. K. Dawyck.
*_G. Veitchii_. U. Leonardslee 4.
Gaya Lyallii. G. Guildford 2; B. Exeter (exposed side killed back) 14; S. Dorking 10, Glasnevin, Stow† 2; U. Aldenham, Enfield 7, Fota, Kew (G. in 1908–9), Ludgvan, Mangotsfield 5, Westonbirt.
Gaylussacia sp. U. Aldenham.
Genista aethnensis. K. and U. Aldenham; U. Enfield.
G. dalmatica. S. Aldenham.
G. elegans. K. Headfort; B. Rostrevor†.
G. ephedroides. K. Rostrevor.
G. ferox. K. Headfort; U. Enfield, Rostrevor (also two larger plants K.).
G. germanica. S. Aldenham, Enfield.
G. hispanica. K. Aldersey (also B.) 4, Grinstead (also B.), K. Oxon (also G.), Llandaff 3, South Molton 6; B. Aldenham, Nymans 15, Wakehurst.
G. maderensis. K. Headfort.
G. monosperma. K. Headfort.
G. pilosa. G. Aldersey 12; B. Mangotsfield 3; S. Glasnevin (old plant); U. Enfield 20.
G. tinctoria. S. Aldenham; U. Enfield.

**Gentiana Lawrencei.* U. Wisley.
**G. sino-ornata.* U. Wisley 3.
Geum pyrenaicum. K. Wisley 4.
Gevuina Avellana. K. Wakehurst 1 ; U. Rostrevor.
Gladiolus tristis. K. Monreith 1.
**Glaucidium palmatum.* U. Enfield 3, Monreith.
Gleditschia caspica. S. Aldenham, Glasnevin.
G. chinensis. K. Aldenham.
G. japonica. U. Aldenham.
G. triacanthos. U. Aldenham, Enfield.
Glyptostrobus heterophyllus. K. Headfort 3, Rostrevor.
Gnidia carinata. K. Rostrevor†.
Gordonia anomala. G. Leonardslee† 3 ; U. Fota, Rostrevor.
G. obliqua. K. Leonardslee† 3.
Grevillea alpina. K. Rostrevor ; B. Lanarth.
G. Hilliana. K. Rostrevor.
G. juniperina. K. Crawley 7.
G. longifolia. K. Nymans 3, Wakehurst† 3.
G. ornithopoda. K. Lanarth 18.
G. robusta. B. Rostrevor.
G. rosmarinifolia. K. Enfield 7, Headfort ; G. Uckfield 7 ; B. Lanarth ; S. Nymans 6.
G. sulphurea. K. Enfield 2 ; Kew (one plant U.) ; S. Nymans 6, Wakehurst ; U. Fota.
Greyia Sutherlandii. B. Rostrevor.
Griselinia littoralis. K. Burnham 1 ; K. Kew (also B.) 6 ; G. Aldersey 10 ; U. Enfield 1, Leonardslee 20 (injured 1908).
Gunnera chilensis (*manicata*). K. Slough (in frames 3–7) ; B. Aldenham, Mangotsfield 10, Uckfield 8, Wakehurst, Enfield (crowns on N.E. side) ; U. Bosahan 25.
G. magellanica. S. Aldenham, U. Wakehurst.
G. scabra. K. Slough (in frame) ; B. Enfield 20, Epping 5, Osterley : S. Aldenham, Guildford 19 ; U. Wakehurst.
Gymnocladus canadensis. U. Aldenham.

Habranthus pratensis. U. Enfield†, Isleworth, Wakehurst.
Hakea eucalyptoides. K. Abbotsbury.
H. florida. S. Rostrevor†.
H. glabella. U. Rostrevor†.
H. pubescens. K. Abbotsbury.
H. pugioniformis. S. Rostrevor ; U. Fota.
H. rugosa. U. Rostrevor.
H. saligna. K. Abbotsbury.
H. ulicina. U. Rostrevor.
Halesia diptera. }
H. hispida. } U. Aldenham.
H. tetraptera. }

Haloragis alata. B. Rostrevor.

Hamamelis arborea.
H. japonica, and var. *Zuccariniana.*
H. mollis.
H. vernalis.
H. virginica.
} U. Aldenham.

Hedysarum multijugum. U. Aldenham.

Helianthemums. K. Aldersey (some G.), Burnham, Grinstead, Harrow (nearly all garden forms), Oxon (some G.), Monmouth, Slough, Stow ; B. Wisley (grey-leaved stood better than green-leaved) ; S. Nymans.

Helianthemum canescens. S. Enfield ; B. Woodbridge.

H. formosum. K. Aldersey, Bergholt, Enfield (also B.), Woodbridge (in open) 1 ; B. Aldenham ; S. Nymans ; Woodbridge† S. 2–3.

H. halimifolium. K. Carnarvon, Enfield (in open) ; S. Kew (many K. in 1908–9) ; U. Enfield† S. 7.

H. Libanotis. K. Enfield 6.

H. ocymoides. K. Carnarvon, Harrow 6, Glasnevin.

H. ocymoides var. *algarvense.* K. Enfield 20, Harrow 8, Slough 4.

H. umbellatum. K. Enfield 10, Harrow 1, Slough 1 ; S. Kew, (many K. in 1908–9).

Helichrysum bellidioides. B. Enfield 6, Grinstead ; U. Wisley 4.

H. rosmarinifolium (*Ozothamnus*). K. Aldenham, Ashford, Enfield 5, Exeter 10, Llandaff 2, Mangotsfield 3, Stow 1, Wakehurst (also G.) 7, Wisley 3 ; G. Grinstead ; B. Nymans ; S. Crowsley.

H. trinerve. U. Enfield, Wisley.

Helwingia rusciflora. U. Aldenham, Enfield, Leonardslee 6.

Heteromeles arbutifolia. K. Leonardslee 2 ; G. Wakehurst.

Hibbertia Readii. U. Rostrevor.

Hippeastrums. K. Isleworth.

Hippophae rhamnoides.
H. rhamnoides procera.
} U. Aldenham.

Hoheria populnea. G. Enfield 1 ; B. Nymans 5, Wakehurst† ; S. Rostrevor ; U. Ludgvan.

H. populnea var. *lanceolata.* U. Fota.

**Holboellia coriacea.* U. Kew†.

H. latifolia. B. Colesborne ; U. Bosahan.

Hydrangea anomala. U. Aldenham.

H. arborescens. U. Aldenham, Enfield, Wakehurst 3.

H. aspera. B. Aldenham.

H. Bretschneideri. U. Aldenham.

H. hortensis. B. Aldenham ; U. Wakehurst.

H. paniculata. U. Aldenham.

H. quercifolia. G. Wakehurst ; S. Enfield†.

H. radiata.
H. rosea.
} U. Aldenham.

**H. Sargentiana.* G. Leonardslee ; U. Aldenham.

H. setchuensis. U. Aldenham.

Hydrangea xanthoneura. U. Aldenham; Wakehurst.
H. xanthoneura var. *glabrescens.* U. Aldenham.
Hymenanthera crassifolia. U. Aldenham, Enfield.
H. dentata var. *angustifolia.* U. Rostrevor.
H. novae-zelandiae. U. Rostrevor.
Hymenosporum flavum. K. Rostrevor.
Hypericum arboreum. } S. Aldenham.
H. Ascyron. }
H. aureum. U. Aldenham (also B.), Enfield 16, Kew (injured in 1908–9).
H. balearicum. K. Abbotsbury, Burnham, Glasnevin, Wakehurst (also G.).
**H. Buckleyi.* K. Dawyck; U. Leonardslee.
H. calycinum. G. Chipping Norton 18; S. Aldenham, Enfield.
H. chinense. K. Romford; G. Glasnevin; S. Enfield.
H. Coris. K. Abbotsbury, Enfield, Stow; B. Harrow 2.
H. cuneatum. K. Abbotsbury.
H. densiflorum. K. Romford; U. Aldenham.
H. dubium. S. Aldenham.
H. elatum. G. Enfield; S. Aldenham.
H. fragile. K. Abbotsbury, Enfield (also G.), Glasnevin, Harrow 2, Wakehurst (also G.); B. Grinstead; S. Aldenham.
H. hircinum. S. Aldenham.
H. Hookerianum. K. Glasnevin; G. Aldersey 6; B. Aldenham, Slough 2.
H. inodorum. U. Aldenham.
H. Kalmianum. G. Glasnevin; U. Aldenham.
H. lysimachioides. S. Aldenham, Enfield.
H. Moserianum. G. Aldersey 12; Monreith (also B. and S.) 20.
H. Moserianum var. *tricolor.* K. Romford; S. Sherborne 10; Enfield 15.
H. olympicum. K. Abbotsbury, Enfield (old plants only S.), Glasnevin; Harrow 3.
H. patulum. G. Enfield (some B.) 15, Wakehurst; B. Aldenham (also S.), Oxon; S. and U. Monreith 30.
H. patulum Henryi. B. Aldenham, Slough 2; S. Stow; U. Burnham, Enfield 1.
H. reptans. K. Abbotsbury, Romford; G. Monreith (also B.) 15; B. Hever 4.
H. tomentosum. K. Romford.
H. uralum. B. Glasnevin, Enfield; S. Aldenham.
H. Webbii. S. Aldenham.
H. 7780 Vilmorin. S. Aldenham.

Idesia polycarpa. B. Enfield 6; U. Aldenham, Westonbirt.
Ilex Aquifolium. B. Northwick; S. Aldenham, Enfield (some lost leaves).
I. Aquifolium var. *Hodginsii.* B. Northwick 7 (lost leaves).
I. Cassine. B. and K. Stevenage.

**Ilex chinensis.* S. Aldenham.
I. corallina. K. Aldenham; S. Enfield 1, Wakehurst 4.
I. crenata. U. Aldenham, Enfield.
I. decidua. B. Aldenham.
I. dipyrena. U. Aldenham, Enfield.
I. Fargesii megalophylla. K. Aldenham; U. Leonardslee, Wakehurst 4, Westonbirt.
I. fragilis. S. Rostrevor.
I. glabra. U. Aldenham.
I. insignis. K. Aldenham (protected); U. Rostrevor.
I. latifolia. S. Aldenham; U. Wakehurst 20.
I. opaca. U. Aldenham.
I. Pernyi. U. Aldenham, Burnham, Leonardslee and most places.
I. platyphylla. U. Rostrevor.
**I. Veitchii.* U. Burnham, Leonardslee.
I. verticillata. U. Aldenham.
**I. yunnanensis.* U. Aldenham, Burnham, Wakehurst 4.
Illicium floridanum. U. Wakehurst† 5.
I. religiosum. K. Wakehurst† 5; B. Nymans 4; U. Bosahan.
Incarvillea Delavayi. K. Aldersey 6.
I. grandiflora. B. and S. Aldersey 4.
I. grandiflora var. *brevipes.* S. Aldersey; U. Wisley.
**Indigofera amblyantha.* U. Kew.
I. Gerardiana. G. Burnham 3; B. Wisley 15; U. Mangotsfield 6; Nymans.
**I. Kirilowi.* U. Kew.
**I. pendula.* K. Aldenham; U. Kew.
Iris bracteata. K. Harrow 3.
**I. Bulleyana.* U. Wisley.
I. Douglasii. Various forms; K. and B. Harrow 3–7.
**I. Forrestii.* U. Wisley.
I. gracilipes. U. Wisley.
I. japonica. B. Harrow (but flowered); S. Enfield (under yews, flowered well).
I. Sisyrinchium. K. Wisley; U. Enfield (sheltered).
I. tenax. K. Harrow (some forms) 5.
I. Wattii. G. Colesborne, Enfield.
Ismene calathina. K. Isleworth.
I. festalis. } K. Isleworth.
I. undulata. }
Isopogon formosus. K. Abbotsbury.
I. latifolius. K. Rostrevor.
Itea ilicifolia. K. Crowsley, Dawyck; S. Kew (injured 1908–9), Lanarth; Wakehurst (also U.).
I. virginica. U. Aldenham; Kew (injured in 1908–9).

Jacobinia floribunda. U. Rostrevor.
Jamesia americana. U. Aldenham.

**Jasminum Beesianum.* U. Aldenham, Enfield, Wisley.
J. floridum. B. Enfield, Grinstead.
J. frutescens. S. Colesborne.
J. Giraldii. B. Aldenham.
J. officinale. S. Aldenham (also U.).
J. primulinum. K. Carnarvon 4, Crowsley; G. Alderseyt† 8, Grinstead; B. Crawley 9, Nymans† 6; U. Wakehurst†.
J. revolutum. S. Aldenham.
**J.* 11472 Forrest. B. and U. Aldenham.
**J.* 6771 Vilmorin. B. Aldenham.
Jubaea spectabilis. U. Fota.
Juglans boliviensis. U. Rostrevor.
J. cinerea. U.
J. coarctata. U.
J. Duclouxiana. S.
J. mandschurica. U. Aldenham.
J. nigra. U.
J. rupestris. U.
J. sigillata. K.
Juniperus bermudiana. K. and G. Wakehurst 2; S. Rostrevor.
J. Cedrus. U. Rostrevor.
J. chinensis. U. Aldenham.
J. japonica. U. Aldenham.
J. fragrans. S. Aldenham.
J. pachyphlaea. B. Leonardslee 5; S. Aldenham, Enfield 6.
J. procera. K. Glasnevin, Rostrevor; S. Headfort, Wakehurst 1.
J. virginiana. U. Aldenham.

**Keteleeria Davidiana.* K. Dawyck; S. Wakehurst 3; U. Leonardslee 6, Rostrevor.
K. Fortunei. K. Wakehurst; S. Headfort.
**Kirengeshoma palmata* (Japan). U. Enfield, Ingleborough, Monreith.
Knightia excelsa. U. Ludgvan.
Kniphofia aloides nobilis. K. Harrow 3.
K. caulescens. B. Hever; S. Enfield, Wakehurst.
K. Northiae. K. Wakehurst; B. Stow; S. and U. Enfield.
K. Tuckii. G. Enfield, Northwich (also B.).
Koelreuteria paniculata. S. Aldenham; U. Enfield.
Kolkwitzia amabilis. U. Aldenham.

Lagerstroemia indica. G. Stevenage 4; S. Glasnevin; U. Rostrevor.
Lagunaria Patersonii. K. Headfort.
Lambertia formosa. U. Ludgvan.
Lapageria rosea. G. Tal-y-Cafn† N. 6; B. Abbotsbury (also S.), Wakehurst† (also S.); S. Bosahan (many lost leaves) 10, Nymans† N. 6; U. Rostrevor.
Lardizabala biternata. K. Stevenage; S. Wakehurst†.

Larix americana. U. Aldenham.
L. Griffithii. U. Wakehurst 5.
L. kurilensis.
L. occidentalis. U. Aldenham.
L. sinensis.
Laurelia serrata. B. Abbotsbury; U. Rostrevor.
Laurus Camphora. K. Headfort; S. Bosahan 8, Fota 10.
L. canariensis. S. Rostrevor.
L. nobilis. K. Byfleet (also G. 5), Guildford 5, Oxon (also G.); G. Monmouth 7, Northwich 38, Wye; B. Aldenham (also S.), Carnarvon 28, Chipping Norton, Downham 18; S. Enfield (leaves browned), Slough 2, Wakehurst; U. Aldersey 10, Leonardslee 28 (injured in 1908–9).
Lavandula dentata. K. Headfort.
L. spica. K. Alnwick 12, Wye; B. Aldenham; S. Wisley 4.
L. spica var. *alba.* K. Burnham 2; B. Aldenham, Slough 2.
L. spica var. Grappenhall. K. Gatton.
Lavatera assurgentiflora. K. Fota 14.
L. maritima bicolor. K. Enfield 1 and 2, Fota 14; B. Rostrevor (one large plant K.).
L. Olbia. K. Glasnevin, Wisley; G. Burnham 2, Enfield 1; B. Grinstead.
Leitneria floridana. U. Rostrevor.
Leonotis Leonurus. K. Abbotsbury.
Leptospermum australe. U. Rostrevor.
L. ericoides. K. Headfort; U. Rostrevor.
L. laevigatum. K. Nymans 3; U. Rostrevor.
L. Nairnii. U. Rostrevor.
L. pubescens. U. Rostrevor.
L. scoparium. K. Dorking, Glasnevin, Harrow 4, Headfort, Wisley (and all vars.); S. Wakehurst; U. Carnarvon, Enfield†, Fota, Rostrevor.
L. scoparium Boscawenii. K. Carnarvon, Nymans 2, Grinstead; B. Lanarth; S. Wakehurst.
L. scoparium Chapmanii. K. Carnarvon 4; K. Llandaff; B. Wakehurst; U. Rostrevor.
L. scoparium Nicholsii. K. Glasnevin, Llandaff; B. Uckfield; S. Lanarth; U. Carnarvon, Crawley, Enfield†, Rostrevor, Wakehurst.
L. stellatum. U. Rostrevor.
Lespedeza cyrtobotrya. B. Aldenham.
L. Sieboldii. B. Aldenham.
Leucocrinum montanum. K. Monreith 5.
Leucopogon Richei. G. Glasnevin; B. Rostrevor†.
Leucothoe axillaris. U. Aldenham.
L. Catesbaei. S. Aldenham.
Lewisia leana. K. Wisley.
L. Tweedyi. K. Wisley.

Leycesteria formosa. G. Monmouth 7; B. Wisley 5–10; S. Aldenham, Enfield 20, Glasnevin.

Libertia grandiflora. K. Abbotsbury (also B.); B. Enfield; U. Wakehurst.

Libocedrus Bidwillii. S. Wakehurst 1.

L. chilensis. K. Dawyck, Glasnevin; U. Rostrevor, Wakehurst.

L. Doniana. B. Nymans 15; U. Rostrevor.

L. macrolepis. K. Dawyck, Headfort, Wakehurst (also B.); U. Rostrevor.

Libonia floribunda. U. Fota.

Ligustrum angustissimum. U. Aldenham.

L. brachystachyum. U. Aldenham.

L. Delavayanum. U. Aldenham, Enfield.

L. Henryi. K. Dawyck, Stevenage; B. Glasnevin; S. Aldenham; U. Enfield 2.

L. Ibota. U. Aldenham, Enfield.

L. japonicum. U. Aldenham.

L. japonicum vars. *coriaceum* and *coriaceum revolutum.* U. Aldenham, Enfield.

L. lucidum. U. Aldenham.

L. Massalongianum. B. Rostrevor.

L. medium. U. Aldenham.

L. Prattii. U. Burnham.

L. Quihoui. S. Aldenham, Enfield.

L. strongylophyllum. S. Aldenham; U. Enfield.

L. Walkeri. U. Rostrevor.

L. 515A.
L. 4718 Vilmorin. } U. Aldenham.
L. 6034 Forrest.

**Lilium regale.* U. Burnham, Enfield, Monreith.

**L. Sargentiae.* U. Monreith.

**L. sutchuense.* U. Monreith.

Lindera Benzoin. U. Aldenham.

L. glauca. K. Leonardslee 5.

L. macrophylla. K. Leonardslee 5; S. Wakehurst 5.

L. obtusiloba. S. Wakehurst 4.

L. praecox. U. Aldenham.

L. sericea. U. Wakehurst 4.

Linum arboreum. K. Kew 5–8; U. Enfield 1.

L. monogynum. K. Abbotsbury, Enfield.

Liquidambar styraciflua. U. Aldenham.

Liriodendron tulipifera. U. Aldenham; Chatsworth (many trees 80 years old, split from top to bottom by frost).

L. chinense. U. Aldenham.

Lithospermum intermedium. K. Harrow 7; S. Enfield.

L. prostratum. K. Aldenham, Aldersey (also G.) 3–12, Harrow 7, South Molton 3; G. Abbotsbury, Slough (also B.) 10; B. Stow, Grinstead, Wakehurst (also S.), Wisley 5; S. Mangotsfield.

Lithospermum prostratum var. Heavenly Blue. K. Aldenham, Harrow 2.

Litsaea japonica. U. Rostrevor†.

Lomatia ferruginea. K. Abbotsbury; S. Headfort, Wakehurst 8; U. Aldenham, Fota, Rostrevor.

L. longifolia. } U. Rostrevor.
L. tinctoria.

Lonicera alpigena.
L. coerulea.
L. ciliosa. } U. Aldenham.
L. deflexicalyx.
L. Ferdinandi.

L. flava nova. K. Slough 2.

L. gymnochlamydea. U. Aldenham.

L. Heckrothii. S. Aldenham; U. Enfield.

L. hirsuta.
L. hispida.
L. Kesselringii.
L. Kocheana. } U. Aldenham.
L. Korolkowii.
L. lancifolia.
L. Ledebourii.

L. Maackii. S. Aldenham, Enfield.

L. macrophylla. U. Aldenham.

L. nitida. B. Wisley 6; U. Aldenham, Burnham, Enfield, Mangotsfield 4, Tortworth 5.

L. pileata. U. Aldenham, Enfield 4, Mangotsfield 4.

L. pyrenaica. U. Aldenham.

L. quinquelocularis. U. Aldenham, Enfield.

L. Ruprechtiana. U. Aldenham.

L. saccata. U. Aldenham.

L. sempervirens. K. Slough 2.

L. spinosa.
L. Standishii. } U. Aldenham.
L. subdentata.
L. tartarica.

L. thibetica. U. Aldenham, Mangotsfield 3.

L. tomentella. U. Aldenham.

L. tragophylla. U. Aldenham.

L. trichopoda. S. Aldenham.

L. trichosantha. U. Aldenham.

L. xerocalyx. U. Aldenham.

**L.* 269 Farrer. } U. Wisley, Enfield.
**L.* 372 Farrer.

Loropetalum chinense. K. Aldenham; B. Trebah 18.

Lupinus arboreus. K. Enfield, Slough 2; S. Morton 3, Wisley.

Lycium chinense.
L. pallidum. } U. Aldenham.
L. ruthenicum.

Lycoris squamigera. U. Colesborne, Enfield, Isleworth.
Lysichitum camtschatcense. U. Monreith.
Lysimachia Henryi. B. Grinstead.

Magnolia acuminata. U. Aldenham.
M. Campbellii. K. Crawley 6; U. Wakehurst 10, Westonbirt†.
**M. Delavayi.* K. Tal-y-Cafn† S.W. 5 (older plants leaves injured); B. Crowsley (in open), Uckfield; S. Dorking 6, Lanarth, Mangotsfield 2, Nymans 2, Wakehurst 6; U. Crowsley†.
M. discolor. K. Stevenage.
M. Fraseri. U. Aldenham.
M. glauca. K. Stevenage; U. Aldenham.
M. hypoleuca. U. Aldenham.
M. Kobus. U. Aldenham, Enfield.
M. macrophylla. G. Glasnevin; S. Uckfield 7.
M. parviflora. U. Aldenham.
**M. salicifolia.* U. Aldenham.
**M. Sargentiana.* U. Burnham, Kew.
M. Soulangeana. U. Aldenham.
M. stellata. K. Exeter; S. Aldenham; U. Enfield.
M. tripetala. U. Aldenham.
M. Watsonii. S. Aldenham.
M. Wilsonii. U. Kew; Wakehurst 3.
Mallotus japonicus. K. Glasnevin.
Malva umbellata. K. Abbotsbury 6.
Malvastrum capense. K. Rostrevor.
Mandevilla suaveolens. K. and G. Tal-y-Cafn† 8; U. Wakehurst† 2.
Margyricarpus setosus. K. Aldersey 1–10, Enfield 5, Harrow 4.
Marlea begonifolia. G. Glasnevin; B. Aldenham; W. Wakehurst 2.
M. platanifolia. B. Aldenham; U. Wakehurst 2.
Maytenus ilicifolia. U. Rostrevor.
Mazus reptans. S. Enfield; U. Wisley.
Melaleuca armillaris. B. Rostrevor.
M. Beissiana. K. Rostrevor.
M. hypericifolia. K. Rostrevor†.
M. nesophila. K. Rostrevor.
Melia Azedarach. B. Rostrevor.
Melianthus major. G. Enfield (covered with ashes), Wakehurst†.
Melicytus lanceolatus. B. Leonardslee 4.
M. ramiflorus. U. Rostrevor.
Meliosma Beaniana. U. Aldenham; Kew 4.
M. cuneifolia. U. Aldenham.
M. myriantha. K. Abbotsbury.
M. Oldhamii. U. Kew 9.
M. Veitchiorum. U. Aldenham, Burnham.

Mesembryanthemum intonsum. B. Rostrevor.
Metrosideros diffusa. B. Ludgvan, Rostrevor.
M. florida. B. Fota 6.
M. hypericifolia. B. Ludgvan, Rostrevor.
M. lucida. U. Ludgvan, Rostrevor.
M. robusta. U. Ludgvan.
M. tomentosa. B. Lanarth (2 feet high), Ludgvan.
Microglossa albescens. B. Wisley 4.
**Micromeles Folgneri*. U. Aldenham, Burnham.
Mimulus glutinosus. B. Rostrevor.
M. glutinosus var. *coccineus*. K. Abbotsbury.
Mitraria coccinea. K. Llandaff 2 ; B. Glasnevin, Wakehurst (also S.), Grinstead ; S. Monreith 5, Rostrevor.
Moltkaea petrea. K. Stow.
Montañoa bipinnata. K. Abbotsbury.
Moraea iridioides var. *Mackayi*. B. Rostrevor.
Morus nigra. S. Aldenham.
M. alba. U. Aldenham.
Muehlenbeckia complexa. K. Aldersey (also G.) 1–10, Colesborne, Slough 2 ; G. Exeter 8, Enfield 15, Lanarth ; B. Aldenham, Stow, Wisley ; U. Kew (G. in 1908–9).
M. varians. G. Enfield 20 ; B. Wisley 6.
Musa Basjoo. U. Rostrevor, Uckfield.
Mutisia Clematis. B. Rostrevor.
M. decurrens. S. Rostrevor.
M. ilicifolia. U. Rostrevor.
Myoporum acuminatum. B. Rostrevor.
M. laetum. K. Enfield† 3, Rostrevor ; B. Abbotsbury ; S. Bosahan.
Myrica asplenifolia. U. Aldenham.
M. californica. K. Dawyck ; B. Glasnevin.
M. cerifera. B. Rostrevor ; U. Aldenham.
Myrsine africana. K. Glasnevin ; U. Rostrevor.
M. salicina. B. Rostrevor.
M. semiserrata. K. Glasnevin ; B. Rostrevor.
M. Urvillei. K. Glasnevin, Nymans 3 ; G. Fota 4 ; S. Rostrevor.
Myrtus bullata. K. Nymans 3 ; G. Wakehurst 1 ; S. Rostrevor ; U. Ludgvan.
M. communis. G. Ashford, Dorking 20, Romford 10, Tortworth 15 ; B. Glasnevin, Kew†, Osterley, Wakehurst†, Grinstead ; S. Headfort, Nymans 10 ; U. Bosahan.
M. communis var. *boetica*. S. Rostrevor.
M. communis var. *tarentina*. B. Kew†, Enfield, Grinstead.
M. Luma (*apiculata*). K. Wakehurst (also G.†) 3 ; G. Guildford 10, Tal-y-Cafn† 2–10 (also B.), Uckfield ; B. Glasnevin, Headfort, Lanarth 12, Nymans 8.
M. obcordata. K. Aldenham, Crawley 5 ; G. Wakehurst 1 ; S. Rostrevor.

Myrtus Ugni. K. Tal-y-Cafn† (2–10); also G. Glasnevin; S. Lanarth 12, Nymans† 8.

Nandina domestica. B. Slough 5; S. Aldersey†, Enfield (shed leaves) 15; U. Aldenham, Fota.

Neillia longeracemosa.
N. opulifolia.
N. sinensis.
N. Torreyi.
Nemopanthus canadensis.
} U. Aldenham.

Nerine species and vars. K. Isleworth†.
Nertera depressa. U. Rostrevor.
Nesaea salicifolia. B. Aldenham, Rostrevor, Wakehurst 2, Enfield.
Nierembergia frutescens. K. Enfield 3, Rostrevor, Wisley.
Notelaea excelsa. B. Wakehurst 1.
Nothofagus antarctica. U. Aldenham, Rostrevor.
N. betuloides. U. Rostrevor.
N. Cliffortioides. S. Glasnevin, Rostrevor, Wakehurst 10.
N. Cunninghamii. K. Abbotsbury (young plants); B. Nymans 3, Wakehurst 5; U. Rostrevor.
N. fusca. S. Wakehurst; U. Rostrevor.
N. Menziesii. B. Leonardslee 5, Wakehurst 5; U. Rostrevor.
N. obliqua. U. Aldenham (young plants B.); U. Leonardslee 4, Rostrevor, Tortworth 2.
N. procera. K. Glasnevin; U. Aldenham (also S.), Leonardslee 4, Rostrevor.
N. Solandri. G. Wakehurst; B. Nymans 3.
Nothopanax arboreum. B. Rostrevor.
Notospartium Carmichaeliae. K. Wisley; S. Aldenham; U. Llandaff, Rostrevor, Wakehurst.

Oenothera ovata. K. Harrow 1; Wisley.
Olea arborea. U. Rostrevor.
O. europaea. B. Kew† S., Nymans 8; U. Bosahan, Rostrevor.
O. fragrans. S. Wakehurst 7.
Olearia angustifolia. K. Ludgvan, Rostrevor.
O. argophylla. K. Headfort, Wakehurst (also G.); S. Leonardslee† 10, Rostrevor; U. Bosahan 10. (The only Olearia injured at Abbotsbury.)
O. argophylla × *macrodonta* (?). Self-sown, S. Bosahan.
O. avicenniaefolia. S. Glasnevin, Wakehurst 5.
O. chathamica. K. Rostrevor; B. Poolewe; U. Ludgvan.
O. Colensoi. U. Ludgvan.
O. dentata. K. Glasnevin; G. Dorking 20; B. Trebah, 9.
O. Fosteri. K. Stevenage 7; G. Glasnevin, Leonardslee 20; B. Wakehurst† 4; S. Nymans† 8.
O. furfuracea. U. Wakehurst 3.
O. Haastii. K. Aylesbury (also B.) 25, Byfleet (also G.); G.

Chipping Norton 16, Dorking 20, Monmouth 25; B. Downham, Wisley; U. Aldenham (K. in 1908–9), Aldersey, Enfield 15 (G. in 1908–9), Nymans 8.

Olearia ilicifolia. K. Mangotsfield 2; B. Aldenham; S. Glasnevin.

O. insignis. K. Llandaff; B. Enfield, Glasnevin; S. Lanarth, Woodbridge; U. Rostrevor.

O. macrodonta. K. Aldenham, Aldersey 8, Wisley 10; G. Enfield, Stow 5; B. Glasnevin, Grinstead, Mangotsfield 5, South Molton 6; S. Harrow, Nymans (also U.); U. Wakehurst.

O. moschata. K. Nymans 3; U. Colesborne; Enfield.

O. myrsinoides. B. Glasnevin; S. Nymans 3.

O. nitida. B. Glasnevin, Headfort, Llandaff 2; S. Wakehurst, Nymans (also U.).

O. nummularifolia. U. Aldenham, Colesborne, Enfield 15.

O. pannosa. U. Ludgvan.

O. ramulosa. K. Ludgvan, Rostrevor.

O. semidentata. K. Leonardslee† 3 (also U.), Llandaff, Wakehurst 1; U. Lanarth, Ludgvan, Rostrevor.

O. Solandri. K. Enfield 6, Glasnevin.

O. stellulata (of gardens). K. Aldenham (also G.), Aldersey 8, Ashford, Colesborne, Exeter 14, Llandaff, South Molton (also B.), Stevenage 4, Stow 6, Tortworth (also B.) 5; G. Cobham 3, Woodbridge; B. Chipping Norton 4, Epping 5, Harrow 6, Wakehurst, Wisley 6; U. Enfield (plants pruned in after flowering the preceding summer), Nymans.

O. Traversii. K. Llandaff; S. Glasnevin.

O. virgata. B. Wisley 5; U. Enfield 10.

O. virgata var. *linifolia.* U. Enfield 10.

Ononis arragonensis. U. Aldenham, Enfield.

O. fruticosa. }
O. hircina. } U. Aldenham, Enfield.
O. rotundifolia. }

Onosma albo-roseum. K. Wisley 4; U. Enfield (dry under conifers) 3–4.

Opuntias. K. Grinstead.

Orixa japonica. U. Aldenham.

Osmanthus Aquifolium. U. Aldenham.

**O. armatus.* U. Aldenham, Leonardslee.

**O. Delavayi.* U. Aldenham, Enfield 6, Lanarth, Mangotsfield, Tal-y-Cafn, Tortworth 5.

O. 4109 Vilmorin. U. Aldenham (some S.).

Osteomeles anthyllidifolia. K. Lanarth, Stevenage; B. Aldenham, Leonardslee 4, Wakehurst† 6; S. Crowsley.

O. subrotunda. B. Wakehurst† 2.

Ostrya carpinifolia. }
O. virginica. } U. Aldenham.
Othera japonica. }

Oxalis magellanica. U. Enfield 2, Wisley.

Oxycoccus macrocarpus. S. Aldenham.

Paederia tomentosa (435 Wilson). B. Aldenham.
**Paeonia Cambessedesii* (Corsica). } U. Colesborne.
P. cretica. }
P. lutea. U. Aldenham, Enfield.
P. Mlokosewitschii. U. Colesborne, Enfield.
Paliurus aculeatus. S. Aldenham.
Panax arboreum. S. Wakehurst 3; U. Rostrevor.
P. Colensoi. U. Rostrevor.
P. diversifolium. U. Aldenham.
**Pancratium illyricum.* U. Isleworth.
P. maritimum. K. Isleworth.
Parrotia Jacquemontiana. } U. Aldenham.
P. japonica. }
Parsonsia albiflora. S. Wakehurst† 3; U. Rostrevor.
**Pasithea caerulea.* U. Colesborne†.
Passiflora caerulea. K. Slough 1; G. Nymans† 6; B. Headfort, Lyndhurst† N.
P. caerulea Constance Elliott. K. Enfield† 7.
**Patrinia palmata.* U. Monreith.
**Paulownia Duclouxii.* S. Leonardslee; U. Westonbirt.
**P. Fargesii.* U. Westonbirt.
P. tomentosa lanata. K. young Aldenham (also U. 9 years old); U. Colesborne, Enfield 2, Tortworth 5.
Pelargonium Endlicherianum. S. Wakehurst 5.
Pentapterygium rugosum. B. Wakehurst† 2; U. Ludgvan.
P. serpens. G. Leonardslee† 4.
Pentstemon cordifolius. G. Glasnevin; B. Headfort; U. Rostrevor†, Wakehurst†.
P. isophyllus. K. Harrow 2; S. Enfield 3.
P. Myddelton, Newbury and Southgate Gem. K. Slough 4; B. Enfield.
Peraphyllum ramosissimum. U. Aldenham.
Pernettya mucronata. G. Wisley 12; B. Monmouth 7; S. Harrow 15, Nymans 10; U. Aldenham.
Perovskia atriplicifolia. G. Slough; B. Aldenham, Lanarth, Wisley; S. Enfield 10, Glasnevin; U. Aldersey 10, Mangotsfield 4.
Petteria ramentacea. U. Aldenham.
Peumus Boldus. B. Rostrevor.
Phaedranassa Carmiolii. K. Isleworth.
Phellodendron amurense. } U. Aldenham.
P. amurense × japonicum. }
P. sachalinense. U. Aldenham, Tortworth 1.
Philadelphus Coulteri. G. Glasnevin.
**P. Delavayi.* U. Burnham.
P. Lemoinei. U. Aldenham and all of the Genus.
P. roseus. G. Glasnevin.
P. uniflorus. G. Glasnevin.

Philesia buxifolia. B. Stow 2; U. Rostrevor.
Phillyrea angustifolia. S. Aldenham.
P. angustifolia rosmarinifolia. S. Aldenham.
P. decora.
P. latifolia. } U. Aldenham.
P. media.
Philocladus alpinus. U. Ludgvan.
Phlomis cashmeriana. S. Grinstead.
P. fruticosa. K. Aldenham 1; K. Aldersey (also B.) 5–12; Crowsley 9, Enfield 10, Glasnevin; B. Monreith 15, Wisley 12; S. Wakehurst.
Phoenix canariensis. K. Fota 4; U. Bosahan.
P. senegalensis. S. Fota.
Phormium Colensoi. B. Glasnevin, Headfort.
P. Cookianum. G. Enfield (one plant; others U.), Wisley 5.
P. tenax. K. Aldersey (also B.) 2–10, Hitchin 4, Stow; G. Wisley 20; B. Headfort, South Molton 3; S. Enfield 7, Leonardslee 16 (injured 1908–9), Uckfield, Wakehurst.
P. tenax var. *atropurpureum.* G. Glasnevin; B. Enfield.
Photinia. All species grown at Glasnevin B.
P. Benthamiana. K. Glasnevin.
P. Davidsoniae. B. Aldenham (also S.), Glasnevin, Kew 10.
P. serrulata. S. Aldenham, Enfield 8, Mangotsfield 4, Slough 6; U. Wakehurst (old).
P. serrulata var. *rotundifolia.* K. Glasnevin; B. Wakehurst.
P. villosa. U. Wakehurst.
Phyllocladus rhomboidalis. K. Nymans 6.
P. trichomanoides. U. Rostrevor; Wakehurst 2.
Phyllostachys aurea. G. Abbotsbury 10; S. Aldenham, Enfield 20.
P. fastuosa. B. Aldenham; S. Enfield (only young canes hurt).
P. nidularia. U. Aldenham.
P. viridi-glaucescens. G. Northwich; B. Oxon; U. Aldenham, Kew (G. in 1908–9); Enfield.
**Picea asperata.*
**P. Balfouriana.* } U. Leonardslee.
P. brachytyla. U. Aldenham.
P. complanata.
P. Koyomai. } U. Leonardslee.
P. montigena.
**P. purpurea.*
**P. retroflexa.* } U. Leonardslee.
P. rubra. U. Aldenham.
**P. Sargentiana.* U. Leonardslee.
Picrasma quassioides. U. Aldenham.
Pieris formosa. G. Wisley 12; S. Lanarth.
P. japonica. U. Aldenham.
P. ovalifolia. S. Wakehurst 1.
Pimelea laevigata. S. Wakehurst 3.

Pimelea longiflora. U. Rostrevor.
P. longifolia. U. Ludgvan.
Pinus aristata. U. Aldenham.
P. Armandi. K. Dawyck; S. Headfort; U. Wakehurst 10.
P. Ayacahuite. K. Glasnevin; U. Wakehurst 10.
P. Brutia. B. Glasnevin.
P. canariensis. K. Headfort; Leonardslee 3; U. Rostrevor.
P. cembroides. S. Glasnevin.
**P. densata.* U. Leonardslee.
P. densiflora. B. Headfort.
P. flexilis. U. Aldenham.
P. Greggii. K. Leonardslee 6.
P. halepensis. K. Headfort, Leonardslee 5, Wisley; B. Colesborne (seed from Andalusia), Wakehurst 4.
P. Hartwegii. S. Wakehurst 6.
P. insignis. B. Lanarth (where exposed to E.), South Molton 7; S. Slough 3.
P. Lambertiana. S. Headfort.
P. leucodermis. U. Aldenham.
P. Lindleyana. K. Romford 6.
P. longifolia. K. Leonardslee 3, Rostrevor.
P. Lumholtzii. K. Fota 7.
P. mitis. K. Glasnevin.
P. montana. U. Aldenham.
P. Montezumae. K. Leonardslee 8; S. Glasnevin.
P. osteosperma. K. Headfort.
P. patula. K. Leonardslee 5; B. Glasnevin, Wakehurst 4; S. Headfort; U. Rostrevor.
P. Pseudo-strobus. K. Fota; S. Headfort; Leonardslee 5.
P. Taeda. S. and U. Wakehurst 4.
P. Teocote. K. Fota (young).
**P. Wilsonii.* U. Leonardslee.
**P. yunnanensis.* K. Dawyck; U. Leonardslee.
Piptanthus concolor. B. Aldenham.
P. nepalensis. K. Aldersey 8, Dawyck (nearly all); G. Wisley 2–7; B. Mangotsfield 4; S. Enfield 7.
Pistacia atlantica. K. Leonardslee† 2; B. Rostrevor.
P. Lentiscus. G. Leonardslee† 6; S. Rostrevor.
Pitcairnea caerulea. U. Rostrevor.
P. spathacea. U. Rostrevor.
Pittosporum bicolor. K. Abbotsbury; B. Wakehurst 3.
P. Buchananii. G. Enfield (open); S. Aldenham, Enfield†.
P. Colensoi. B. Grinstead, Harrow 5, Uckfield 6.
P. coriaceum. K. Glasnevin; S. Rostrevor.
P. crassifolium. K. Fota 5, Wakehurst 6.
P. Dallii. U. Ludgvan.
P. eugenioides. K. Ashford, Glasnevin; K. Uckfield (also B.) 6; U. Bosahan 20.

Pittosporum eugenioides variegatum. K. Abbotsbury, Aldenham.
P. Fairchildii. K. Glasnevin.
P. flavum. K. Abbotsbury.
P. Mayi. K. Aldenham 20, Ashford, Glasnevin, Llandaff 2 B. Lanarth; S. Sherborne 6, Uckfield 7; U. Bosahan 20.
P. patulum. U. Ludgvan, Rostrevor.
P. rhomboideum. K. Abbotsbury.
P. tenuifolium. K. Aldenham (old plants B.), Headfort, Stevenage 4; B. Uckfield 6, Wakehurst 5.
P. Tobira. K. Aldenham (also B.†), Grinstead; B. Mangotsfield 3; S. Enfield 4 (K. in 1908–9).
P. umbellatum. B. Ludgvan.
P. undulatum. K. Lanarth, Headfort, Wisley 4–6; B. Glasnevin; Ludgvan, Nymans 6.
Plagianthus divaricatus. U. Fota.
P. pulchellus. K. Abbotsbury, Headfort; G. Glasnevin.
Plagiospermum sinense. K. Dawyck.
Platanus acerifolia. K. Dawyck. All branches up to 15 feet B.
P. occidentalis. } U. Aldenham.
P. racemosa. }
Plumbago capensis. B. Rostrevor†.
Podocarpus acutifolia. G. Leonardslee 3.
P. andina. B. Abbotsbury.
P. chilina. B. Abbotsbury; S. Uckfield 7.
P. dacrydioides. G. Leonardslee 4.
P. elongata. S. Rostrevor.
P. ferruginea. K. Leonardslee 2.
P. Hallii. R. Glasnevin.
P. koreana. U. Aldenham.
P. latifolia. K. Leonardslee 3.
P. macrophylla. B. Leonardslee 6, Wakehurst (also U.) 3.
P. spicata. B. Wakehurst 2.
P. Totara. B. Glasnevin; S. Exeter 5, Wakehurst (also U.) 4.
Pohlia platensis. U. Colesborne†.
Poinciana Gilliesii. K. Fota† 5; S. Wakehurst† 8.
P. regia. K. Abbotsbury.
Poliothyrsis sinensis. U. Aldenham, Wakehurst 3.
Polygala myrtifolia. K. Headfort.
Polypodium Billardieri. B. Rostrevor†.
Pomaderris apetala. K. Nymans 3; B. Rostrevor.
Populus certinensis. } U. Aldenham.
P. generosa. }
**P. lasiocarpa.* U. Aldenham, Burnham.
**P. sinensis.* U. Aldenham.
**P. szechuanica.* K. Aldenham (also B. and S.); U. Kew 4.
P. trichocarpa. U. Aldenham, Enfield.
P. Wislizenii. U. Aldenham.
**P. yunnanensis.* U. Leonardslee, Tortworth 1.

**Potentilla Vilmoriniana.* S. Rostrevor; U. Aldenham, and all the genus.

**Primula Loczii* (Farrer 40). U. Enfield 1, Wisley 2.

**P. Winteri.* U. Wisley.

Prinsepia sinensis. U. Aldenham.

Prostanthera lasianthos. K. Abbotsbury 10; U. Rostrevor.

P. rotundifolia. K. Ashford, Wakehurst†.

P. violacea. S. Rostrevor.

Proustia pyrifolia. B. Rostrevor (recovered well).

Prumnopitys elegans. K. Dawyck; U. Aldenham.

Prunus alleghaniensis.
P. americana. U. Aldenham.
P. canescens.

P. caroliniana. B. Rostrevor.

P. Conradinae.
P. Cuthbertii.
P. demissa. U. Aldenham.
P. emarginata.
P. glandulosa.
P. hortulana.

P. ilicifolia. K. Tortworth 4; B. Aldenham.

P. Lauro-cerasus. G. Chatsworth; B. Aylesbury 40, Lanarth, Oxon; S. Chipping Norton (worse in 1908–9), Downham; U. Aldenham (some S.).

P. Lauro-cerasus caucasica. S. Slough 3; U. Aldenham.

P. Lauro-cerasus latifolia. U. Aldenham.
P. Lauro-cerasus pygmaea.

P. Lauro-cerasus schipkaensis. U. Aldenham, Enfield.
P. Lauro-cerasus Zabeliana.

P. lusitanica. B. Aldenham (exposed to E.); S. Aldenham.

P. lusitanica azorica. U. Aldenham.

P. lusitanica myrtifolia. B. Monmouth 7; S. Oxon; U. Aldenham.

P. mandschurica.
P. maritima. U. Aldenham.
P. melanocarpa.

**P. mira.* B. Glasnevin; U. Aldenham, Wisley.

P. Mume.
P. orthosepala. U. Aldenham.
P. Potaninii.
P. pubigera.

P. pumila. G. Glasnevin; U. Aldenham.

P. Riverchonii.
P. rufa.
P. rufomicans.
P. salicina. U. Aldenham.
P. Sargentii.
P. serrulata.
P. subhirtella.

Prunus tenuiflora. U. Aldenham.
**P. thibetica.* U. Aldenham, Burnham.
P. tomentosa. } U. Aldenham.
P. Wilsoni. }
P. 241 Wilson. S. Aldenham.
Pseudopanax chatamicum. U. Ludgvan.
P. crassifolium. U. Ludgvan, Rostrevor.
P. ferox. B. Leonardslee 3; S. Wakehurst; U. Rostrevor.
P. Lessonii. B. Rostrevor.
Pseudotsuga chinensis. K. Dawyck.
P. japonica. U. Aldenham.
Psoralea punctata. K. Trebah (also B.).
Pteris serrulata. B. Rostrevor.
Pterocarya caucasica. U. Aldenham.
**P. hupehensis.* U. Kew 9.
P. rhoifolia. } U. Aldenham.
P. stenoptera. }
Pteroceltis Davidiana. S. Aldenham.
P. Tatarinowi (268 Wilson). B. Aldenham.
P. Wilsonii. B. Colesborne.
Pueraria japonica. K. Nymans† W. 6.
Punica Granatum. S. Glasnevin; U. Rostrevor†.
Purshia tridentata. S. Aldenham.
Puya chilensis. U. Rostrevor.
Pyracantha angustifolia. B. Glasnevin, Wisley 6; S. Enfield 7; U. Nymans.
P. crenulata. K. Dawyck.
P. Gibbsii. U. Aldenham.
P. Rodgersiana. S. Aldenham.
P. 5804 Forrest. K. Aldenham.
Pyrus americana.
P. astracanica.
P. caloneura.
P. Cashmere crab.
P. chinensis.
P. coronaria.
P. cuspidata.
P. domestica.
P. elaeagrifolia. } U. Aldenham.
P. floribunda.
P. glaucescens.
P. Goulardii.
P. hybrida.
P. intermedia.
P. ioensis.
P. latifolia.
P. Matsumurana.
P. Maximowiczii.

Pyrus munda subrachnoides.
**P. orthocarpa.*
P. Parkmanni. U. Aldenham.
P. Pashia.
**P. pekinensis.* U. Aldenham, Leonardslee.
P. pinnatifida.
P. Prattii.
P. Ringo.
P. (*Malus*) *Sargentii.*
P. (*Sorbus*) *Sargentiana.*
P. sikkimensis.
P. spectabilis.
P. sphaerocarpa.
P. tianschanica.
P. Toringo. U. Aldenham.
P. transitoria-toringoides.
P. Tschonoskii.
P. utahensis.
P. Veitchii.
P. vestita.
P. Vilmoriniana.
P. yunnanensis.
P. Zumi.
P. 8924 Forrest.

Quercus acuta (?) from Sikkim. G. Colesborne.
Q. acuta bambusaefolia.
Q. acutifolia. U. Aldenham.
Q. Aegilops (Valonia Oak). U. Colesborne 6.
Q. agrifolia. S. Rostrevor.
Q. alnifolia. B. Leonardslee 6; U. Rostrevor.
**Q. aquifolioides.* S. Kew 9.
Q. californica.
Q. castaneaefolia. U. Aldenham.
Q. chrysolepis. U. Rostrevor.
**Q. cleistocarpa.* S. Kew 9.
Q. conferta. U. Aldenham.
Q. dealbata. K. Wakehurst 5.
Q. densiflora. U. Aldenham, Rostrevor.
Q. dentata. U. Aldenham.
**Q. Engleriana.* U. Kew 9.
Q. falcata. U. Aldenham.
Q. Fragnus. B. Aldenham.
**Q. Gilliana.* U. Kew 9.
Q. glabra. U. Aldenham.
Q. glandulifera. S. Glasnevin.
**Q. Henryi.* S. Kew 9.

Quercus Ilex. B. Aylesbury 40 ; Northwich (lost all leaves) ; S. Newbury ; U. Aldenham.
Q. incana. U. Rostrevor.
Q. Libani. U. Aldenham.
Q. Lucombeana. S. Chipping Norton 50 (lost all leaves) ; U. Aldenham.
Q. lusitanica.
Q. macedonica.
Q. Mirbeckii.
Q. nana. } S. and U. Aldenham.
Q. nigra. B. Leonardslee 5 ; U. Wakehurst 2.
Q. O'Brayeana. G. Colesborne.
**Q. oxyodon.* U. Kew 9.
Q. palustris.
Q. Phellos.
Q. pontica.
Q. prinoides.
Q. serrata. } U. Aldenham.
Q. spathulata. S. Glasnevin.
Q. Suber. B. Oxon, Rostrevor, Wakehurst 2 ; S. Glasnevin ; U. Bosahan.
Q. Toza.
Q. velutina. } U. Aldenham.
Quillaja Saponaria. S. Nymans† 6.

Raoulia australis. K. Stow ; S. Enfield ; U. Monreith, Wisley.
R. glabra. B. Harrow ; U. Enfield, Wisley.
R. subsericea. U. Enfield, Wisley.
Raphiolepis Delacouri. B. Aldenham ; S. Kew 5, Wakehurst 6.
R. indica. B. Aldenham, Wakehurst 5.
R. japonica. U. Aldenham.
R. ovata. K. Colesborne, Headfort ; G. Burnham 3 ; U. Enfield.
Raspberry canes. K. Ross-shire (not known before).
Restio subverticillata. S. Rostrevor 9 (recovering slowly).
Rhabdothamnus Solandri. K. Enfield† 1 ; Rostrevor.
Rhamnus Alaternus. K. Headfort ; B. and S. Aldenham.
R. Alaternus var. *angustifolia.* S. Aldenham.
R. Alaternus var. *Pereiri.* K. Harrow 3 ; S. Enfield.
R. californica.
R. dahurica.
R. erythroxylon.
R. hybrida Billardii.
R. libanotica. } U. Aldenham.
Rhaphitamnus cyanocarpus. G. Uckfield 3 ; B. Lanarth, Leonardslee 4 ; S. Nymans† W. 6.
Rhododendron. All Chinese species at Tortworth uninjured except *R. lutescens* ; all Wilson's and Forrest's uninjured at Lanarth ; all large-leaved Chinese uninjured at Dawyck.

Rhododendron Albrechtii. K. Dawyck.
R. adenogynum. U. Kew.
R. arboreum vars. K. Wisley (also B.) 4; S. Tal-y-Cafn.
R. argenteum. K. Dawyck; S. Tal-y-Cafn.
R. argyrophyllum. B. Dawyck.
R. argyrophyllum var. *cupulare.* B. Dawyck.
R. assamicum. K. Wakehurst 1.
R. Aucklandi. K. Tal-y-Cafn (also B.).
R. Aucklandi, hybrids of. U. Bergholt.
**R. Augustinii.* K. Dawyck; U. Tal-y-Cafn.
**R. auriculatum.* U. Tal-y-Cafn.
**R. bullatum.* K. Leonardslee 3, Wakehurst 2, Kew; G. Bergholt.
**R. cephalanthum.* U. Kew.
R. chartophyllum. B. Dawyck.
R. ciliatum. G. Tal-y-Cafn (also B. and S.), Wisley 3; B. Dawyck.
R. ciliicalyx. K. Rostrevor.
R. × *Cornubia.* U. Tal-y-Cafn.
**R. colophyton.* U. Tal-y-Cafn.
**R. coreanum* (not Chinese). U. Kew.
**R. crassum.* K. Dawyck; B. Kew.
**R. Cuthbertii* (not Chinese). B. and K. Kew.
**R. cyanocarpum.* U. Kew.
R. Dalhousiae. U. Rostrevor.
**R. Delavayi.* B. Dawyck; S. Kew.
R. dilatatum. K. Dawyck.
**R. discolor.* U. Tal-y-Cafn.
R. Edgeworthii. U. Rostrevor.
R. Edgeworthii × *Countess of Haddington.* U. Tal-y-Cafn† N.
R. Falconeri. K. Wisley 3.
**R. Fargesii.* U. Tal-y-Cafn.
R. floribundum. B. Dawyck.
R. fragrantissimum (*formosum* × *Edgeworthii*). U. Tal-y-Cafn† N.
R. fulvum. U. Kew.
R. glaucum. B. Dawyck.
**R. haematodes.* U. Kew.
**R. Harrovianum.* K. Dawyck.
**R. hippophaefolium.* U. Kew.
R. Hodgsonii. U. Dawyck.
R. hypoglaucum. K. Dawyck.
R. indicum Hinodegeri. S. Nymans 3.
**R. insigne.* U. Kew.
**R. intricatum.* B. Stow; U. Tal-y-Cafn, Wisley.
R. irroratum. K. Dawyck.
R. Kaempferi. B. Dawyck.
R. Keysii. K. Dawyck.
R. lacteum. B. Dawyck.
R. linearifolium. U. Wakehurst 5.
**R. lutescens.* S. Tortworth; U. Tal-y-Cafn 5.

Rhododendron Maddenii. G. Tal-y-Cafn.
**R. Metternichii*. K. Dawyck.
R. micranthum. B. Dawyck.
**R. ovatum*. B. Kew 5.
**R. oreodoxa*. U. Tal-y-Cafn.
**R. oreotrephes*. U. Kew.
**R. oxyphyllum*. K. Rostrevor; Tal-y-Cafn.
**R. polifolium*. U. Kew.
**R. polylepis*. B. Dawyck.
R. ponticum. B. Northwich 38.
**R. Prattii*. U. Kew.
**R. prostratum*. U. Kew.
R. racemosum. S. Stow; U. Mangotsfield 2, Wisley.
**R. rhombicum*. K. Dawyck.
**R. Sargentianum*. U. Kew.
R. × Sesterianum (ciliatum × Edgeworthii). S. Nymans 4.
**R. sino-grande*. U. Lanarth.
**R. Souliei*. K. Nymans; U. Tal-y-Cafn.
R. sublanceolatum. B. Glasnevin, Nymans 3.
**R. taliense*. B. Dawyck.
**R. Traillianum*. U. Kew.
**R. trichocladum*. U. Kew.
R. triflorum. U. Wakehurst 10.
**R. villosum*. B. Dawyck.
**R. Watsoni*. K. Dawyck.
**R. Williamsianum*. U. Kew.
**R. Williamsonii*. U. Tal-y-Cafn.
R. Wilsonii. U. Wisley.
**R. yunnanense*. B. Dawyck.
*R. 6181 F. B. and K. Tal-y-Cafn; U. East Bergholt.
Rhodostachys andina. S. Enfield (covered).
R. argentina. S. Enfield (flowered 1917, covered).
R. pitcairniaefolia. B. Enfield (covered), Lanarth; U. Rostrevor.
Rhus ailanthoides. U. Aldenham.
R. copallina. U. Aldenham.
R. corallina. }
R. Coriaria. } U. Aldenham.
R. cotinoides. S. and U. Aldenham; U. Enfield.
R. Cotinus. S. Aldenham; U. Enfield.
R. integrifolia. K. Rostrevor.
R. Osbeckii. K. Monreith 5; U. Aldenham.
R. semialata. U. Aldenham, Enfield 6.
R. vernicifera. U. Aldenham, Enfield 8.
Ribes alpinum. }
R. americanum. }
R. amictum. } U. Aldenham.
R. Carrierei. }
R. chilense. U. Aldenham; K. Dawyck.

Ribes cruentum. U. Aldenham, Mangotsfield 2.

R. Culverwellii.

R. diacanthum.

R. divaricatum.

R. floridum. U. Aldenham.

R. glaciale.

R. glutinosum.

R. himalayense.

R. laurifolium. U. Aldenham ; Enfield 1 ; Wakehurst 2.

R. leptanthum.

R. Maximowiczii.

R. mogollonicum.

R. montanum. U. Aldenham.

R. pinetorum.

R. Pringlei.

R. prostratum.

R. Spaethianum.

R. speciosum. U. Aldenham ; K. Dawyck ; G. Wisley 8 ; B. Stevenage ; S. Aldenham, Wakehurst† 12 ; U. Aldersey† 6–12, Enfield 7, Mangotsfield 2.

R. stenocarpum.

R. stenophyllum.

R. subvestitum. U. Aldenham.

R. tenue.

R. tenuifolium.

R. urceolatum.

R. viburnifolium. U. Aldenham ; K. Wakehurst† 1.

R. Warscewiczii. U. Aldenham.

Richardia africana. K. and B. Isleworth, Wisley.

Robinia Decaisneana.

R. hispida. U. Aldenham.

R. Kelseyi.

R. neo-mexicana.

Romneya Coulteri. G. Aldenham, Enfield, Wakehurst† ; B. Dorking 10, Exeter 11, Harrow 6, Lanarth, Rostrevor ; S. Guildford 6 ; U. Mangotsfield 3.

R. trichocalyx. K. Aldersey 15 (also G.) ; G. Enfield 8, Wakehurst 2 ; B. Rostrevor.

Rosa anemonaeflora. B. Aldenham.

R. Arnoldiana. U. Aldenham.

R. Banksiae. S. Wakehurst† 10.

R. bracteata. K. Wakehurst† (also G.) ; B. Enfield 8, Grinstead ; S. Nymans† 6 ; U. Cobham 13 (B. in 1908–9), Mangotsfield 5.

**R.* Chinese new species. U. All at Kew.

Roses, Garden vars. :

Teas. K. Byfleet (if not planted deep enough) ; G. Northwich, Newbury ; B. Downham, Slough.

Hyb. teas. K. Oxon ; G. Edenhall Monmouth, Northwich, B. Slough.

**Roses, Garden vars.*

H. Ps. K. Oxon; G. Edenhall; S. Byfleet; U. Monmouth.
Ramblers and Climbers. K. Oxon (many); G. Byfleet, Edenhall, Northwich.
China. G. Chatsworth.

Rosa glomerata.
R. Kelleri. } U. Aldenham.
R. longicuspis.

**R. Moyesii.* U. Aldenham, Enfield.
**R. omeiensis.* U. Aldenham, Burnham, Enfield.
R. Prattii.
R. prostrata. } U. Aldenham.
R. Soulieana. S. Aldenham.
R. Wichuraiana Jersey Beauty. B. Aldenham; U. Enfield, Wisley.
**R.* 291. Farrer. U. Aldenham, Enfield.
**R.* 1306. Wilson. S. Aldenham.
**R.* 10,843. Forrest. U. Aldenham.
Rosmarinus officinalis. K. Alnwick 12, Headfort, Kew, S. Molton 7; B. Aldenham, Aldersey, Colesborne, Slough 3, Wisley 5; S. Wakehurst.
R. officinalis prostratus. K. Grinstead, Slough 2, Stow, Wakehurst 4.
**Rubus bambusarum.* K. Glasnevin; U. Enfield.
R. biflorus. U. Aldenham, Enfield.
R. cissoides pauperatus. K. Wisley 3; B. Mangotsfield 3, Glasnevin, Grinstead; S. Enfield 20 (exposed); U. Enfield† 7.
R. chroosepalus. K. Dawyck.
R. deliciosus. U. Aldenham, Enfield.
**R. flagelliformis.* B. Aldenham; S. Enfield.
R. frondosus. U. Aldenham.
**R. Henryi.* B. Aldenham.
R. ichangensis. B. Aldenham; G. Glasnevin.
R. incisus. U. Aldenham.
R. innominatus. U. Aldenham.
**R. irenaeus.* B. Aldenham.
R. Lambertianus. B. and S. Aldenham.
R. mesogaeus. B. Aldenham.
R. Parkeri. B. Aldenham, Glasnevin.
**R. polytrichus.*
R. pubescens. } B. Aldenham.
R. thyrsoides.
R. villosus. } U. Aldenham.

Salix Bockii. K. Dawyck; U. Aldenham, Enfield.
**S. hypoleuca.* U. Kew 4.
**S. magnifica.* U. Aldenham; Kew 8; Leonardslee; Mangotsfield.
**S. moupinensis.* U. Kew 4.
Salvia aurea. B. Rostrevor.
S. Candelabrum. K. Enfield 7, Wisley; B. Harrow 5, Grinstead

Salvia Grahamii. K. Enfield 2, Glasnevin, Kew, Llandaff 1, Wisley; G. Enfield 7; B. Mangotsfield 1; Rostrevor.
S. interrupta. S. Harrow.
S. prostrata. S. Grinstead.
S. uliginosa. K. Enfield 2, Kew (when exposed); B. Slough 2; U. Enfield 1.
Sambucus neo-mexicana. K. Aldenham.
Santolina Chamaecyparissus. B. and U. Aldenham, Enfield.
Sapindus Drummondii. U. Aldenham.
Sarcococca Hookeri. B. and S. Aldenham; U. Enfield 5, Westonbirt.
S. ruscifolia. G. Stevenage 4; B. Wisley 2–4; U. Aldenham, Enfield 6.
**Sargentodoxa cuneata.* U. Kew †, Leonardslee.
Sarracenia purpurea. U. Rostrevor.
Saxegothaea conspicua. U. Aldenham.
Schinus dependens. K. Aldenham.
Schizandra chinensis. U. Wakehurst † N. 6.
S. grandiflora. K. Aldenham.
S. Henryi. U. Westonbirt.
S. rubrifolia. U. Aldenham.
Securinega ramiflora. U. Aldenham.
Sedum confertum. U. Wisley.
S. dendroideum. B. Grinstead.
S. Palmeri. U. Wisley, Enfield.
S. prealtum. G. Glasnevin; S. Rostrevor.
**S. primuloides.* U. Enfield, Wisley.
**S. pruinatum.* U. Enfield, Wisley.
Semele androgyna. G. Fota † S. 6; B. Rostrevor †.
Senecio compactus. K. Fota; U. Enfield 1, Wakehurst 7.
S. elaeagnifolius. K. Headfort, Stevenage; G. Enfield 4; S. Wakehurst 7.
S. Greyi. B. Crowsley, Glasnevin, Lanarth; S. Enfield.
S. Hectori. G. Glasnevin; U. Ludgvan, Rostrevor.
**S. incanus.* U. Wisley.
S. Kirkii. U. Ludgvan.
S. laxifolius. K. Aldenham (also S.); B. Glasnevin; U. Enfield, Wakehurst 7, Wisley.
S. Monroi. G. Glasnevin; B. and U. Wakehurst 5.
S. perdicioides. K. Glasnevin, Rostrevor.
S. rotundifolius. S. Lanarth, Rostrevor (also U.).
Shepherdia argentea. } U. Aldenham.
S. canadensis. }
Sinomenium acutum. U. Aldenham.
**Sinowilsonia Henryi.* U. Colesborne.
**Smilax discotis.* S. Wisley.
S. laxifolia. B. Aldenham.
S. scobinicaulis. U. Aldenham.

Smilax Sieboldiana. B. Aldenham.

S. Veitchii. U. Aldenham.

Smodingium argutum. B. Rostrevor.

Solanum Capsicastrum. S. Isleworth.

S. crispum. K. Crawley 9, South Molton 6; G. Burnham 4; B. Lanarth; S. Carnarvon 5, Enfield† 3, Stow; U. Mangotsfield 4, Wakehurst 7.

S. jasminoides. K. Chipping Norton 5, Enfield† 7, Epping 3, Llandaff, Mangotsfield, Monreith† S. (also G.) 7, Tal-y-Cafn† S.W. 2–5, Slough 1, South Molton (also B.) 3, Stow 3; G. Colesborne†, Fota, Lanarth; U. Wakehurst†.

Sollya heterophylla. K. Exeter† 5, Fota†, Rostrevor†; G. Wakehurst† 3.

Sophora grandiflora. S. Monreith† 15.

S. japonica. U. Aldenham.

S. japonica pendula. B. Slough 3.

S. tetraptera. K. Sherborne 15; B. Wakehurst†; S. Nymans† 6.

S. tetraptera var. *microphylla.* S. Enfield, Mangotsfield.

S. viciifolia. B. Aldenham, Wisley; U. Enfield 7.

Sorbus Harroviana. U. Lanarth.

Spartium junceum. K. Aldersey (also B.) 3–10, Enfield, Gatton 12, Llandaff 2, Monreith (also B. and S.) 3, Oxon (also G.), Stow, Grinstead; G. Wakehurst (also B.); B. Wisley 10.

Sphacele campanulata. K. Rostrevor.

Sphaeralcea Munroana. K. Rostrevor; U. Enfield 3.

S. pedata. B. Enfield 3.

Spiraea. All U. at Aldenham except *S. bullata.*

S. bullata. S. Aldenham, Enfield.

S. Millefolium. U. Aldenham.

S. Veitchii. U. Burnham.

*S. Wilsonii. U. Burnham, Westonbirt.

Sprekelia formosissima. K. Isleworth.

Staphylea colchica. } U. Aldenham, Enfield.
**S. holocarpa.* }

S. pinnata. U. Aldenham.

Statice auriculaefolia. K. Harrow 3.

Stauntonia hexaphylla. G. Stevenage 20; S. Wakehurst† S. 6.

Stenocarpus salignus. S. Rostrevor.

Stephanandra flexuosa. } U. Aldenham.
S. Tanakae. }

S. 54 Farrer. U. Enfield, Wisley.

Sterculia platanifolia. U. Fota.

Stranvaesia Davidiana. U. Aldenham, Wakehurst† 4.

S. glaucescens. K. Aldenham, Headfort; B. Wakehurst 5.

S. undulata. S. Glasnevin; U. Aldenham, Burnham, Wakehurst 5, Westonbirt.

Strawberries. Givon's Prolific. Laxton's Latest. Laxton's Latest of all. B. Guildford 2.

Stuartia pentagyna.
S. Pseudo-camellia. } U. Aldenham.
S. serrata. U. Leonardslee 6.
Styphelia fasciculiflora. S. Rostrevor.
Styrax japonica. U. Aldenham, Wakehurst 8.
S. Obassia. K. Dorking ; U. Wakehurst 8.
**S. Veitchiorum.* U. Kew 9, Leonardslee.
**S. Wilsonii.* K. Colesborne, Stevenage (also G. and B.) ; G. Stow, Wisley 2 ; U. Tortworth 3, Wakehurst 3.
Sutherlandia frutescens. K. Llandaff 2 ; Rostrevor (also S.).
Swainsonia coronillaefolia var. *alba.* S. Rostrevor.
**Sycopsis sinensis.* S. Aldenham (also U.), Enfield 3 ; U. Wakehurst 3.
Symplocos crataegoides. U. Aldenham.
Syringa japonica
S. Julianae.
S. Komarowi.
S. × *Lutece.*
S. persica.
**S. pinnatifolia.*
S. reflexa. } U. Aldenham.
**S. Sargentiana.*
**S. Sweginzowii.*
S. vulgaris.
S. Wilsonii.
S. yunnanensis.
S. 786. Purdom.

Tacsonia mollissima. K. Lanarth.
T. quitensis. G. Trebah† 7.
Tamarix gallica. S. Aldenham.
T. Pallasii rosea. B. and S. Aldenham.
T. tetrandra. S. Aldenham ; U. Enfield.
Tapiscia sinensis. K. Aldenham ; U. Kew 9 (injured in 1908–9), Rostrevor.
Taxodium mexicanum. K. Fota 5.
T. mucronatum. S. Rostrevor.
Taxus adpressa. U. Aldenham.
T. baccata. B. Northwich, Exeter (side facing E., also S.) ; S. Alden ham, Chatsworth, Enfield.
T. canadensis.
T. cuspidata.
T. repanda. } U. Aldenham.
T. 4053 *Wilson.*
Tecoma radicans. K. Byfleet† ; S. Aldenham, Enfield† S.
Telopea oreades. U. Ludgvan.
T. speciosissima. U. Ludgvan.
Templetonia retusa. K. Abbotsbury 4.
Tetracentron sinense. U. Wakehurst 2.

Tetraclinis articulata. S. Rostrevor.
Teucridium brevifolium. U. Rostrevor (one K.).
Teucrium Chamaedrys. U. Aldenham, Enfield.
T. fruticans. K. Nymans 4, Slough 3, Wakehurst 7 (also G.); G. Lanarth 20, Tal-y-Cafn† S.W. 2–10; B. Mangotsfield† 3; U. Rostrevor (some B.).
T. latifolium. K. Chipping Norton 4.
**Thalictrum dipterocarpum.* U. Wisley 4.
Thuya dolabrata. } U. Aldenham.
T. occidentalis. }
T. occidentalis Spaethii. K. Wisley.
Thymes. K. nearly all species Harrow; B. Enfield.
Thymus corsicus. K. Harrow 4.
T. ericaefolius. K. Harrow 5.
T. micans. K. Gatton.
T. strictus. K. Harrow 2.
T. Serpyllum albus. B. Gatton.
T. Serpyllum lanuginosus. K. Gatton.
Tilia cordata. }
T. mandschurica. } U. Aldenham.
T. Miqueliana. }
T. Oliveri. U. Aldenham, Tortworth.
T. petiolaris. U. Aldenham.
Torreya californica. U. Aldenham.
Trachelospermum crocostomum. S. Lanarth 20; U. Wakehurst† 2.
T. Forrestii. S. Aldenham.
T. jasminoides. K. Nymans† 6; B. Lanarth 12; S. Wakehurst† 4.
Tricuspidaria dependens. K. Dawyck, Grinstead, Monreith (also B.) 4; G. Uckfield 5; B. Carnarvon 4, Crowsley, Enfield 5, Nymans 4, Wakehurst† 10; S. Crawley 9, Headfort; U. Rostrevor (one S.).
T. lanceolata. K. Aldenham (most plants, also B.), Dawyck, Epping 6, Llandaff (also G.); G. Uckfield (also B.) 7; B. Abbotsbury (one K.), Carnarvon 4, Crowsley, Exeter 14, Glasnevin, Lyndhurst 6, Monreith† 15, Tal-y-Cafn (2 years' growth killed), Wakehurst 9, Woodbridge; S. Crawley 9, Headfort, Nymans† N. 8; U. Westonbirt.
Triosteum perfoliatum. U. Aldenham.
Tritonia bracteata. U. Isleworth.
Tsuga Brunoniana. B. Glasnevin; U. Rostrevor, Wakehurst 8.
T. chinensis. U. Wakehurst 3.

Ulex europaeus. B. Aldenham, Cobham, Bergholt, Nymans (in open).
U. europaeus fl. pl. K. Aldenham, Leonardslee, Oxon (nearly all), Grinstead; G. Kew (also B. and S.) 25, Monmouth 30, Stow, Wakehurst (also B.); B. Burnham 20, Nymans, South Molton 4, Uckfield, Wisley, 4; S. Enfield, Farnborough.
U. Gallii. B. Aldenham.

Ulex nanus. B. Aldenham, Farnborough, Slough, Wisley 4; U. Enfield 15.

Ulmus parviflora.
U. racemosa. } U. Aldenham.

Umbellularia californica. U. Rostrevor.

Vaccinium arboreum. B. Kew 10.

V. erythrocarpum.
V. hirsutum. } U. Aldenham.

V. Mortinia. K. Kew 6.

Vegetables:

Broccoli, Kales, Brussels Sprouts. K. Chatsworth, Downham, Farnborough, Monmouth, Wye.

Globe Artichokes. K. Aylesbury, Beaconsfield, Dorking (also G.), Newbury; G. Slough.

Verbena chamaedryfolia. K. Grinstead, Harrow 1, Monreith 2, Stow.

V. venosa. K. Monreith 20, Slough 4, Stow; G. Enfield.

Veronica angustifolia. K. Kew, Wisley.

V. anomala. U. Woodbridge 1.

V. Armstrongii. K. Wisley 4.

V. azurea. K. Aldenham.

V. Balfouriana. K. Gatton 7, Hever 4; G. Glasnevin; S. Aldenham.

V. Bidwillii. K. Harrow 5, Slough 3; B. Aldenham.

V. buxifolia. U. Aldenham.

V. canterburyensis. B. Glasnevin; U. Aldenham.

V. chatamica. K. Aldenham.

V. cupressoides. K. Harrow 6; B. Wisley 6; U. Aldenham.

V. decumbens. U. Aldenham.

V. Dieffenbachii. G. Glasnevin.

V. diosmifolia. K. Kew, Wisley 3; U. Rostrevor.

V. edinensis. K. Aldenham; B. Enfield.

V. elliptica. K. Kew.

V. epacridia. B. Glasnevin.

V. Gauntlettii.
V. Godefroyae.
V. Guthrieana. } K. Aldenham.

V. Hectori. K. Wisley 3; S. Enfield 10.

**V. Hermione.* K. Aldenham.

V. Hulkeana. K. Aldenham, Aldersey† (also B.) 7–10, Guildford 10, Mangotsfield 2, Wisley 3; B. Glasnevin, Headfort.

V. Kirkiana. U. Aldenham.

V. × La Seduisante. K. Aldenham, Enfield; S. Hayling Island 8.

V. ligustrifolia.
V. Lindsayi. } U. Aldenham.

V. lobelioides. K. Aldenham (also S.), Tortworth 2; B. Enfield 6

V. macrocarpa. K. Mangotsfield 2.

V. × *newryensis.* K. Kew.

Veronica parviflora. K. Kew, Enfield (old plants, seedlings S.), Wisley 5–10 (seedlings S.); B. Glasnevin.
V. pinguifolia. U. Woodbridge 1.
V. salicifolia. K. Harrow (also B., seedlings U.), Stow, Wisley 5–10; G. Hargham 6; S. Enfield; U. Carnarvon, Woodbridge 1.
V. speciosa. K. Kew.
V. var. 'Autumn Glory.' K. Hever 4; G. Woodbridge; B. Enfield, Glasnevin, Wisley.
V. Traversii. K. Aylesbury (also G. and B.) 15, Northwich 10 Wisley (also G.) 10–20; B. South Molton; S. Kew, Wisley 5; U. Aldenham (K. in 1895), Carnarvon, Enfield, Headfort, Wye.
V. Veitchii. K. Dorking 10, Enfield, Glasnevin.
Veronicas in general. K. Abbotsbury (many K. and others B.), Colesborne (most shrubby kinds; some B.), Crawley (all except *salicifolia*), Gatton, Harrow, Lanarth (some G. or B.), Nymans, all *Andersonii* vars.; Slough, N. Zealand vars.; G. Exeter; B. Crowsley (nearly all), Downham, Headfort, Newbury, Trebah (all except 'Royal Blue'), Wakehurst (especially *speciosa* vars.), Whitby; S. Hayling Island, Wakehurst (Whipcord vars.).
Viburnum affine. U. Westonbirt.
V. betulifolium. U. Aldenham.
**V. buddleifolium*. U. Burnham, Enfield 2.
V. bullatum. U. Aldenham, Enfield 6.
V. burejaeticum. U. Aldenham.
V. Carlesii. U. Aldenham, Enfield, Mangotsfield 3, Stow, Wake hurst 7, Westonbirt, Wisley.
V. cassinioides. U. Aldenham, Westonbirt.
**V. ceanothoides*. G. Wisley 2.
V. cylindricum. S. Crowsley, Wakehurst 7, Grinstead; U. Aldenham.
V. dasyanthum. S. Aldenham.
V. Davidi. S. Dorking 8; U. Aldenham, Burnham, Enfield 2, Wakehurst 5, Westonbirt.
V. dilatatum. U. Aldenham.
V. foetidum. K. Aldenham, Dawyck.
V. foetidum var. *rectangulum*. B. Aldenham; U. Westonbirt.
V. Harryanum. K. Kew (also B.) 8; S. Aldenham.
V. Henryi. K. Stevenage; U. Aldenham (also S.), Stow, Westonbirt.
V. hupehense. U. Aldenham.
V. ichangense. S. Aldenham.
V. japonicum. U. Aldenham, Wakehurst†.
V. Lentago.
V. lobophyllum.
V. Mariesii.
V. molle.
} U. Aldenham.
V. odoratissimum. K. Aldenham; B. Headfort, Lanarth, Wakehurst (also S.); S. Rostrevor.

Viburnum orientale. } U. Aldenham.
V. ovalifolium. }
V. propinquum. K. Dawyck; U. Aldenham.
V. prunifolium. } U. Aldenham.
V. pyrifolium. }
V. rhytidophyllum. U. Aldenham, Burnham, and most places.
V. rufidulum. U. Aldenham.
V. rugosum. K. Aldenham, Crawley 5.
V. Sargentii. U. Aldenham, Westonbirt.
V. Sieboldii. U. Aldenham.
V. theiferum. U. Aldenham, Westonbirt.
V. Tinus. K. Aylesbury (also G. and B.) 40, Hitchin (also B.); G. Byfleet, Wisley; B. Burnham, Oxon, Tortworth 15; S. Aldenham, Aldersey.
V. tomentosum. U. and S. Aldenham.
V. tomentosum var. *plicatum.* S. Aldenham.
V. utile. U. Aldenham, Burnham.
V. venosum. U. Aldenham, Westonbirt.
V. venosum Canbyi. U. Aldenham.
V. Wrightii. U. Aldenham.
Vinca major variegata. G. Slough 3.
Visnea Mocanera. S. Rostrevor†.
Vitex Agnus-castus. S. Aldenham.
V. littoralis. K. Abbotsbury.
Vitis Coignetiae. B. Edenhall 9.
V. flexuosa and vars. *major* and *Wilsonii.* U. Aldenham.
V. Henryi. K. Kew; U. Colesborne, Enfield.
V. Piasezkii. }
V. purpurea. }
V. rivularis. } U. Aldenham, on walls.
V. sinensis. }
V. solanis. }
V. striata. K. Headfort; G. Carnarvon 8, Lyndhurst 4; B. Rostrevor†.
V. vulpina. } U. Aldenham.
V. 508 Purdom. }

Weinmannia racemosa. U. Rostrevor.
W. sylvicola. G. Glasnevin.
Westringia rosmariniformis. B. Rostrevor†.
Whipplea modesta. U. Rostrevor.
Widdringtonia Whytei. K. Abbotsbury; B. Leonardslee† 4.
Wistaria multijuga. U. Aldenham, Enfield.
W. polystachya. S. Aldenham.
W. sinensis. U. Aldenham.

Xanthoceras sorbifolia. U. Aldenham.
Xanthorrhiza apiifolia. U. Aldenham, Enfield.
Xylosma racemosum var. *pubescens.* G. Glasnevin; U. Rostrevor.

Yucca angustifolia. B. Aldersey 14; S. Enfield.
Y. baccata. U. Rostrevor.
Y. filamentosa. K. Harrow 7; G. and S. Aldersey; B. Wisley 8; U. Enfield 5.
Y. flaccida. B. Wisley 7; U. Enfield 20.
Y. gloriosa. B. Aldersey 14, Enfield 15, Wisley 12; U. Monmouth.
Y. recurvifolia. G. Enfield 15 (some B.; others, younger plants, S.); B. Stow, Wisley 5.
Y. rupicola. G. Colesborne.
Y. Sprenger's hybrids. B. Lanarth; U. Colesborne.

Zanthoxylum acanthopodium. K. Leonardslee, Rostrevor.
Z. alatum. B. Wakehurst 7.
Z. americanum. U. Aldenham.
**Z. Bungei.* U. Aldenham, Leonardslee.
Z. piperitum. S. Aldenham.
Z. planispinum. K. Aldenham; U. Wakehurst 2.
Z. schinifolium. S. Aldenham.
Zenobia speciosa (*Andromeda pulverulenta*). U. Aldenham.
Zephyranthes candida major. B. Isleworth.
Z. candida × *citrina.* K. Isleworth.
Zizyphus Giraldii. S. Rostrevor.

DELPHINIUMS AT WISLEY, 1917.

THREE plants of each of two hundred and twenty-nine stocks of perennial Delphiniums were received for trial at Wisley in the autumn of 1915. They were planted on a well-dug, well-manured border and grown on for judging in 1915. The Floral Committee examined them on July 5 and again on July 20, 1917, and recommended the following awards:

Award of Merit. **(A.M.)**

SINGLE.

White.

227, 228, 229. Moerheimi (Barr, Ruys, Forbes) (**A.M.** 1909, Cutbush).

Light blue—eye light.

188, 189. Capri (Barr, Ruys).
192. Belladonna grandiflorum (Ruys).

Dark blue—eye light.

88. Professor Coleman (Baker).

Light blue bicolor—eye light.

90. Col. Sir Wyndham Murray (Blackmore & Langdon).
89. Lady Hammick (Blackmore & Langdon).

Dark blue bicolor—eye light.

12, 13. Lamartine (Barr, Ruys) (**A.M.** 1910, Perry).

SEMI-DOUBLE.

Light blue—eye light.

190. Lady Georgina Legge (Kelway).
127. Mrs. Shirley (Blackmore & Langdon).
103. Rozenlust (Ruys).

Light blue—eye dark.

186. Kingston Queen (Smith).
120. Mrs. A. J. Watson (Blackmore & Langdon).

Dark blue—eye dark.

183, 184. Harry Smetham (Ruys, Blackmore & Langdon) (**A.M.** Blackmore & Langdon, 1912).

Highly Commended (XXX).

SINGLE.

Light blue—eye light.

29. Hamlet (Bunyard).
77. Lord Lansdowne (Blackmore & Langdon).

Dark blue—eye light.

68, 70. Conspicua (Blackmore & Langdon, Barr).
62. Florence (Forbes).
75. His Excellency (Barr).

Dark blue—eye dark.

145. Lady Ravensworth (Ruys).

Light blue bicolor—eye dark.

92. Dawn (Kelway).

Dark blue bicolor—eye light.

60. Mrs. T. G. Baker (Baker).

Dark blue bicolor—eye dark.

19, 50. Macbeth (Hill, Bunyard).

SEMI-DOUBLE.

Light blue—eye light.

166. Dr. Lodwidge (Kelway) (A.M. 1912, Kelway).
9. Edwin Beckett (Baker).
67. Galicia (Baker).
165. Lovely (Kelway) (A.M. 1912, Kelway).
181. Mrs. James Kelway (Wisley) (A.M. 1912, Kelway).
185. Perfection (Blackmore & Langdon).
115. Star of Devon (Godfrey).
135. Statuaire Rude (Blackmore & Langdon) (A.M. 1908, Blackmore & Langdon).

Light blue—eye dark.

125. Amos Perry (Ruys).
131. Sergeant Beranger (Blackmore & Langdon).

Dark blue—eye light.

100, 101. Aeroplane (Barr, Ruys).
35. Attraction (Forbes).
98. Lord Curzon (Blackmore & Langdon).
52. Nobilis (Baker).

Dark blue—eye dark.

106. Corry (Ruys).
74, 75. Novelty (Blackmore & Langdon, Ruys).
41, 42. Robert Cox (Barr, Blackmore & Langdon).

DOUBLE.

Pale Lemon.

222. Luna (Baker).
223. Progression (Ruys) (**A.M.** 1908, Wallace).

Light blue—eye light.

80. Ma Mie (Barr).
32. Rev. E. Lascelles (Baker) (**A.M.** 1907, Walters).

Commended (**XX**).

Single light blue—eye light.

215, 216. Lize (Ruys, Barr).
202. Queen Mary (Bunyard).

Single dark blue bicolor—eye light.

47. Rt. Hon. A. E. Fellowes (Kelway).

Semi-double dark blue—eye light.

81. Miss Britton (Barr).

In addition the following, which appeared in the trial, had previously received an Award of Merit, but, as seen at the present trial, were not adjudged equal to those mentioned above :

221, Beauty of Langport (1895, Kelway) ; 194, Belladonna semiplenum (1910, Perry) ; 102, Colonel Crabbe (1912, Forbes) ; 112, Cymbeline (1912, Bunyard) ; 202, Darius (1912, Bunyard) ; 109, Dr. Bergman (1912, Forbes) ; 117, Dusky Monarch (1912, Kelway) ; 2, Henry Moissan (1914, Blackmore & Langdon) ; 132, Lavanda (Ferguson) ; 71, Jessica (1912, Bunyard) ; 78, J. S. Sargent (1912, Forbes) ; 147, Lizzie Van Veen (1912, Box) ; 178, Monarch (1903, Notcutt) ; 134, Mrs. Colin McIver (1916, Blackmore & Langdon) ; 191, Mr. J. S. Brunton (1912, Ruys) ; 25, 26, The Alake (1907, Clark) ; 1, Smoke of War (1912, Kelway).

VARIETIES.*

1. Smoke of War, B II. 2. †
3. Henri Moissan, B II. 2.
4. Garth, A *b* II. 2.
5. Daniel Osiris, B I. 1.
6. Mme. E. Geny, B II. 1.
7. Daniel Osiris, B I. 1.
8. Monarch of All, B I. 2.
9. Edwin Beckett, B I. 1.
10. Chamud, B II. 1.
11. Mrs. Violet Hulton, B II. 1.

* See footnote, p. 107.

† Where a number is omitted it indicates either that the plants represented by it failed, or that they were wrongly named. The letters and numerals following the names indicate the position of the variety in the descriptive list.

12. Lamartine, A *b* II. 1.
13. ,, ,,
15. T. Thomas, B II. 1.
16. De Ruyter, B II. 1.
18. Zuster Lugten, B II. 2.
19. Gentian Blue, A *b* II. 2.
20. Francis F. Fox, B II. 1.
21. Kingston King, A *b* II. 1.
22. Salland, A *a* III. 2.
23. Prins Hendrik, B II. 1.
24. Hon. R. Lubbock, A *a* III. 1.
25. The Alake, B II. 1.
26. ,, ,, ,,
27. King of Delphiniums, B II. 1.
28. ,, ,, ,, ,,
29. Hamlet, A *a* II. 1.
30. Shylock, B II. 1.
31. Ariel, B I. 2.
32. Rev. E. Lascelles, C II. 1.
34. Steeple, A *b* II. 1.
35. Attraction, B II. 1.
36. Magnificent, A *a* III. 1.
37. Mrs. Trumperant Potts, A *b* II. 1.
38. Remarkable, B II. 1.
39. Lord Rosebery, B II. 1.
40. James William Kelway, B II. 1.
41. Robert Cox, B II. 2.
42 ,, ,, ,,
43. Walter T. Ware, B II. 1.
44. Sir Wroth Lethbridge, B II. 1.
45. Rosalie Ingram, B II. 2.
46. Miranda, B I. 1.
47. Rt Hon. A. E. Fellowes, A *b* II. 1.
48. Purple Rod, B II. 1.
50. Macbeth, A *b* II. 2.
51. Blue Rocket, B I. 2.
52. Nobilis, B II. 1.
53. Apemantes, A *b* II. 2.
54. Telegram, C II. 2.
55. His Excellency, A *a* III. 1.
56. Stateliness, B II. 1.
57. Candidat, A *b* II. 1.
58. F. Carr, B II. 1.
59. Thomas Tilbrook, A *a* III. 1.
60. Mrs. T. G. Baker, A *b* II. 1.
61. K. Th. Caron, A *b* II. 1.
62. Florence, A *a* III. 1.
63. Lady Violet Brassey, A *a* III. 1.
64. T. Lindsay Watson, A *a* III. 1.
65. Masterpiece, A *b* II. 1.
66. Oxonian, A *b* II. 1.
67. Galicia, B I. 1.
68. Conspicua, A *a* III. 1.
70. ,, ,,
71. Jessica, B II. 2.
72. Princess Juliana, B II. 2.
73. King Bladud, C II. 2.
74. Novelty, B II. 2.
75. ,, ,,
76. Lady Granard, A *a* III. 2.
77. Lord Lansdowne, A *a* II. 1.
78. J. S. Sargent, B II. 2.
79. Mrs. O'Connor, B II. 1.
80. MaMie(syn.PrincessRoyal),C II. 1.
81. Miss Britton, B II. 1.
83. Ida R. Elliot, B I. 1.
84. Porthos, B I. 1.
85. Diamant, C III. 1.
86. Royal Standard, A *a* III. 1.
87. Blue Gem, B II. 1.
88. Professor Coleman, A *a* III. 1.
89. Lady Hammick, A *b* I. 1.
90. Col. Sir Wyndham Murray, A *b* I. 1.
92. Dawn, A *b* I. 2.
93. The MacLain of Lockbuie, A *b* I. 2.
94. Bayardo, B II. 1.
95. Splendour, A *b* II. 1.
96. Miss Nelly Weyman, B I. 2.
97. Antigone, B II. 1.
98. Lord Curzon, B II. 1.
100. Aeroplane, B II. 1.
101. ,, ,,
102. Colonel Crabbe, B II. 1.
103. Rozenlust, B I. 1.
104. Capt. Smith Neil, B I. 1.
106. Corry, B II. 2.
107. Duke of Connaught, A *b* II. 1.
108. ,, ,, ,, ,,
109. Dr. Bergman, B II. 1.
110. Lady Nina Balfour, B II. 2.
111. Willy Obreen, B I. 1.
112. Cymbeline, B II. 1.
113. Marion Riddle, B II. 1.
114. Lieutenant Delacommune, B I. 2.
115. Star of Devon, B I. 1.
116. In Remembrance, B II. 2.
117. Dusky Monarch, B II. 2.
118. Bassanio, B I. 1.
120. Mrs. A. J. Watson, B I. 2.
122. Andrew Carnegie, B II. 1.
125. Amos Perry, B I. 2.
127. Mrs. Shirley, B I. 1.
128. Progenitor, B II. 2.
129. Glory, B I. 1.
130. Lieutenant Vasseur, C III. 1.
131. Sergeant Beranger, B I. 2.
132. Lavanda, B I. 1.
133. Chantry Queen, B I. 2.
134. Mrs. Colin McIver, B I. 1.
135. Statuaire Rude, B I. 1.
136. Ustane, B II. 2.
137. Nymphe, B I. 1.
138. Mrs. Brouwer, B I. 1.
139. Hypatia, B I. 1.
140. Lady Conway, A *b* I. 2.
143. Ditton Blue, A *b* II. 1.
144. Blue Prince, A *b* II. 1.
145. Lady Ravensworth, A *a* III. 2.
147. Lizzie van Veen, A *a* II. 1.
148. Queen of Bath, A *a* II. 1.
149. Spire, A *b* II. 2.
150. Countess of Leitrim, A *b* II. 2
151. René Quinton, C II. 1.
152. Nansen, A *b* II. 1.
153. Lord Kitchener, B I. 1.
154. James P. Robertson, B I. 1.
155. Lady Maud Warrender, A *b* II. 1
156. Turquoise, B II. 1.
157. Ampère, B II. 2.
158. Nerissa, B II. 1.
159. Clipper, A *a* II. 1.
161. Lorenzo de Medici, B I. 1.
162. Mrs. R. M. Donaldson, A *a* III. 2.
163. John Forbes, A *b* I. 1.
164. Lavender, A *b* I. 1.
165. Lovely, B I. 1.
166. Dr. Lodwidge, B I. 1.

167. Baroness Henrietta van Thuyll, B I. 2.
168. Elsie, B I. 1.
169. ,, ,,
170. Arago, B II. 2.
171. Queen of Spain, B I. 1.
172. Mrs. Fred Carr, B I. 1.
173. Sordello, A *b* I. 1.
174. Blenheim, A *a* II. 1.
175. Queen Wilhelmine, A *a* II. 1.
176. ,, ,, ,,
178. Monarch, A *b* I. 1.
179. N. F. Barnes, A *b* II. 1.
180. Lady Joan Verney, A *b* I. 1.
181. Mrs. James Kelway, B I. 1.
182. Explorateur Flamand, B I. 2.
183. Harry Smetham, B II. 2.
184. ,, ,, ,,
185. Perfection, B I. 1.
186. Kingston Queen, B I. 2.
187. Lorna Doone, A *b* II. 1.
188. Capri, A *a* II. 1.
189. ,, ,,
190. Lady Georgina Legge, B I. 1.
191. Mr. J. S. Brunton, A *a* II. 1.
192. Belladonna grandiflorum, A *a* II. 1.
193. Belladonna, A *a* II. 1.
194. Belladonna semiplenum, B I. 1.
195. Fanny Stormonth, A *a* II. 1.
197. Hugo Poortman, B I. 1.
199. Eva, B II. 2.
200. Twertonian, A *a* II. 2.
201. Opal, A *a* II. 1.
202. Queen Mary, A *a* II. 1.
203. Branching Persimmon, A *a* II. 1.
206. Persimmon, A *a* II. 1.
208. Yvette Guilbert, A *b* I. 1.
209. Lord Furness, A *a* II. 1.
210. Star of Langport, A *b* I. 1.
211. Azure, A *b* I. 1.
212. China Blue, A *b* II. 1.
213. Geraldine Kelway, A *b* II. 1.
214. Enid, A *b* I. 1.
215. Lize, A *a* II. 1.
216. ,, ,,
217. Glory of Edentown, B I. 1.
219. Lady Isobel, A *a* I. 2.
220. Darius, C I. 1.
221. Beauty of Langport, A *a* I. 2
222. Luna, C I. 2.
223. Progression, C I. 2.
224. Fröken Scheltema, C I. 2.
225. Polar Star, A *a* I. 3.
227. Moerheimi, A *a* I. 1.
228. ,, ,,
229. ,, ,,

A. Flowers Single.

(*a*) Self-coloured.

I. *White or Yellow.*

(1) White.

227, 228, 229. Moerheimi (Barr, Ruys, Forbes), **A.M.** July 5, 1917.—Height 3 feet 6 inches to 5 feet; spike loose, tapering, 18 to 24 inches, branch spikes numerous; flowers fairly large, white, tipped green; eye white with yellow hairs; spur long, sometimes slightly hairy; June 11.* Nos. 227 and 228 each threw some of pale blue flowers (var. Capri, see Nos. 188, 189). Raised by Messrs. Ruys in 1904.

(2) Creamy White.

219. Lady Isobel (Gibson).—Height 4 feet 6 inches; spike loose, tapering, 24 inches; flowers of medium size, cream; eye yellow-bronze; spur long; June 18. Raised by Miss Dent of Ribston Hall, 1910.

221. Beauty of Langport (Ruys).—Height 4 feet 3 inches; spike crowded, tapering, 19 inches; flowers single and semi-double, small to medium, cream; eye yellow; spur long; June 25. Raised by Messrs. Kelway.

(3) Pale Lemon.

225. Polar Star (Barr).—Height 3 feet 6 inches; spike loose, tapering, 15 inches; flowers of medium size, pale lemon yellow; eye yellowish; spur fairly long; June 25.

II. *Light Blue.*

(1) Eye Light.

193. Belladonna (Ruys).—Height 5 feet 6 inches; spike rather lax, tapering, 30 inches, branch spikes numerous; flowers of medium size, indigo, margins lighter; eye bluish white with yellow hairs; spur long, sparingly hairy; June 11.

192. Belladonna grandiflorum (Ruys), **A.M.** July 20, 1917.—Height 4 feet 3 inches; spike rather loose, tapering, 18 inches; branch spikes numerous; flowers rather small, indigo darker streak near apex, outside ultra-marine; eye lilac and yellow; spur long; June 25. Raised by Max Leichtlin.

* The date given is that of first flowering.

174. Blenheim (Forbes).—Height 6 feet 6 inches; spike rather loose, tapering, 17 inches, branch spikes numerous; flowers small, light sky-blue, slightly streaked greenish-purple; eye white; spur short; June 27. Raised by sender.

203. Branching Persimmon (Kelway).—Height 5 feet 3 inches; spike rather loose, tapering, 24 inches, branch spikes numerous; flowers rather small, deep sky-blue, purple spot near apex; eye light purple and yellow; spur long; June 21. Raised by sender.

188, 189. Capri (Barr, Ruys), **A.M.** July 5, 1917.—Height 5 feet 6 inches; spike lax, tapering, 24 inches, branch spikes numerous; flowers of medium size, sky-blue, outside light purplish; eye yellow and purplish-white; spur long; June 18. Of same parentage as 'Moerheimi' (Nos. 227 to 229). Raised by Messrs. Ruys, 1904.

195. Fanny Stormonth (Ruys).—Height 5 feet 6 inches; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers of medium size, indigo with deeper streaks in centre; eye purplish-white and yellow; spur long, sparsely hairy; June 11. Introduced by Messrs. Stormonth.

29. Hamlet (Bunyard), **XXX** July 20, 1917.—Height 6 feet; spike loose, rather blunt, 12 inches; flowers small, sky-blue, some slightly flushed purple; eye white; spur long; July 7. Raised by sender.

215, 216. Lize (Ruys, Barr), **XX** July 5, 1917.—Height 5 feet 6 inches; spike loose, tapering, 12 to 15 inches; flowers fairly large, sky-blue, slightly suffused purple; eye yellowish; spur long, sparsely hairy; June 20. A few flowers inclined to become semi-double. Raised by Mr. W. van Veen.

147. Lizzie van Veen (Barr).—Height 5 feet 6 inches; spike loose, almost blunt, 18 inches, branch spikes numerous; flowers large, sky-blue, faintly streaked purplish; eye purplish white and yellow; spur long; June 20. Foliage narrower than in 215, 216. Raised by Mr. W. van Veen.

209. Lord Furness (Forbes).—Height 5 feet 6 inches, spike fairly loose, tapering, 14 inches, branch spikes rather numerous; flowers small, dark sky-blue lighter centre; eye greenish yellow; spur long; July 2. Raised by sender.

77. Lord Lansdowne (Blackmore & Langdon), **XXX** July 20, 1917.—Height 5 feet; spike fairly loose, tapering, 10 inches; flowers large, deep sky-blue, slightly suffused purplish; eye white and yellow; spur long, sparsely hairy; July 7. Raised by sender.

191. Mr. J. S. Brunton (Ruys).—Height 4 feet 3 inches; spike loose, tapering, 18 inches, branch spikes numerous; flowers rather small, indigo, darker streak near apex, outside ultramarine; eye lilac and yellow; spur long, ultramarine; June 20. Raised by sender.

201. Opal (Kelway).—Height 6 feet 6 inches; spike loose, tapering, 16 inches; flowers small, light sky-blue; eye greenish yellow; spur long, sparsely hairy; June 20. Raised by sender, 1912.

206. Persimmon (Kelway).—Height 5 feet 6 inches; spike loose, tapering, 15 inches, branch spikes numerous; flowers rather small, sky-blue and mauve-purple; eye greenish; spur long, sparsely hairy; June 28. One plant was '**Azure.**' Raised by sender, 1899.

202. Queen Mary (Bunyard), **XX** July 5, 1917.—Height 6 feet 6 inches; spike rather crowded, tapering, 16 inches; flowers large, indigo with lighter streaks and suffused purple; eye cream and yellow; spur short; June 20. Some flowers without spurs. Raised by sender, 1910. 'King of Delphiniums' × 'Belladonna.'

175, 176. Queen Wilhelmine (Ruys, Barr).—Height 7 feet 6 inches; spike loose, tapering, 18 inches, branch spikes long, numerous; flowers large, sky-blue, side petals suffused mauve-purple; eye white and yellow; spur rather short; June 25.

(2) Eye Dark.

159. Clipper (Forbes).—Height 5 feet 9 inches; spike loose, tapering, 22 inches; flowers rather small, deep sky-blue, slightly suffused purple; eye sepia and gold; spur of medium length, sparsely hairy; June 27. Raised by sender.

148. Queen of Bath (Blackmore & Langdon).—Height 5 feet 6 inches; spike loose, blunt, 17 inches; flowers large, sky-blue, slightly suffused light purple; eye sepia and gold; spur long, sparsely hairy; June 20. Raised by senders.

200. Twertonian (Blackmore & Langdon).—Height 5 feet 8 inches; spike loose, tapering, 20 inches; flowers of medium size, sky-blue, some slightly tinged purple; eye greenish white; spur long; June 25. Raised by senders.

III. *Dark Blue.*

(1) Eye Light.

68, 70. Conspicua (Blackmore & Langdon, Barr), No. 68, **XXX** July 20, 1917.—Height 6 feet; spike loose, tapering, 16 to 24 inches; flowers of medium size, indigo, purplish towards apex and centre; eye white and yellow; spur long, sparsely hairy; June 20. No. 70 had numerous branch spikes and foliage different from 68. Raised by Messrs. Blackmore & Langdon.

62. Florence (Forbes), **XXX** July 5, 1917.—Height 5 feet; spike loose, tapering, 18 inches; branch spikes medium; flowers small, indigo streaked lighter; eye white and yellow; spur long, sparsely hairy. June 25. Raised by sender.

55. His Excellency (Barr), **XXX** July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 30 inches, branch spikes numerous; flowers small, indigo deeper at margins; eye purplish white and yellow; spur of medium length; June 21. Raised by sender.

24. Hon. R. Lubbock (Kelway).—Height 6 feet; spike loose, tapering, 42 inches; flowers of medium size, indigo suffused purple; eye cream and yellow; spur of medium length; June 20. Raised by sender.

63. Lady Violet Brassey (Forbes).—Height 5 feet; spike loose, tapering, 18 inches, branch spikes medium; flowers small, indigo, streaked lighter; eye white and yellow; June 25. Raised by sender.

36. Magnificent (Kelway).—Height 6 feet 6 inches; spike loose, tapering, 20 inches; flowers rather small, indigo deeper margins; eye sepia and yellow; spur short; June 20. Raised by sender.

88. Professor Coleman (Baker), **A.M.** July 5, 1917.—Height 6 feet; spike rather close, tapering, 24 inches, branch spikes numerous; flowers of medium size, indigo, some slightly flushed purple; eye green and white; spur of medium length; June 27.

86. Royal Standard (Wisley).—Height 2 feet 6 inches; spike, crowded, tapering, 20 inches, branch spikes numerous; flowers small, indigo, some suffused purple; eye yellowish white; spur long; June 21.

59. Thomas Tilbrook (Barr).—Height 5 feet 6 inches; spike rather crowded, slightly blunt, 18 inches, branch spikes numerous; flowers small, Antwerp blue; eye white and yellow; spur long; June 30.

64. T. Lindsay Watson (Forbes).—Height 5 feet; spike loose, tapering, 18 inches, branch spikes medium; flowers small, indigo streaked lighter; eye white and yellow; spur long, sparsely hairy; July 1. Raised by sender, 1913.

(2) Eye Dark.

76. Lady Granard (Forbes).—Height 4 feet 6 inches; spike fairly loose, tapering, 9 inches, branch spikes numerous; flowers small, indigo, slightly streaked purple; eye sepia and gold; spur long; July 1. Raised by sender.

145. Lady Ravensworth (Ruys), **XXX** July 5, 1917.—Height 4 feet 9 inches; spike fairly loose, tapering, 22 inches; flowers rather small, indigo, very slightly suffused darker; eye sepia and gold; spur long; June 22. Distinctly Verbascum-like. Raised by Messrs. Michie & Co.?

162. Mrs. R. M. Donaldson (Forbes).—Height 7 feet; spike loose, tapering, 18 inches, flowers small, sky-blue; eye sepia and gold; spur fairly long, sparsely hairy; June 30. Mixed stock. Raised by sender.

22. Salland (Ruys).—Height 3 feet; spike loose, tapering, 14 inches; flowers of medium size, royal blue, outside ultramarine; eye yellowish; spur long, sparsely hairy; June 6. Raised by sender.

(*b*) Bicolor.

I. *Light Blue.*

(1) Eye Light.

211. Azure (Kelway).—Height 5 feet; spike loose, slightly tapering, 14 inches; flowers small, sky-blue and mauve-purple; eye greenish; spur long; June 28. Mixed stock. Raised by sender.

90. Col. Sir Wyndham Murray (Blackmore & Langdon), **A.M.** July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 24 inches, branch spikes numerous; flowers semi-duplex, large, indigo, suffused dull purple, some tipped white; eye white and yellow; spur long; June 27. One plant with very hairy inflorescence when young, flowering earlier, with downy spur and outer petals. Raised by senders.

214. Enid (Barr).—Height 5 feet; spike loose, tapering, 15 inches, branch spikes medium; flowers small, indigo, purplish margins; eye white and yellow; spur long; June 26.

163. John Forbes (Forbes).—Height 6 feet 6 inches; spike rather crowded, blunt, 9 inches; flowers small, sky-blue slightly suffused purplish centre; eye mauve-white; spur long, sparsely hairy; June 30. Raised by sender.

140. Lady Conway (Bunyard).—Height 7 feet; spike fairly loose, tapering, 24 inches; flowers of medium size, indigo, slightly suffused purple, outside lilac; eye white and green; spur fairly long; June 20. Some flowers with an extra purple petal. Raised by senders.

89. Lady Hammick (Blackmore & Langdon), **A.M.** July 5, 1917.—Height 6 feet; spike fairly loose, rather blunt, 18 inches; flowers semi-duplex, large, deep sky-blue, suffused purple at base; eye white and yellow; spur long, sparsely hairy; June 30. Very broad petals. Raised by the Rev. E. Lascelles.

180. Lady Joan Verney (Baker).—Height 5 feet 3 inches; spike fairly crowded, tapering, 18 inches; flowers large, sky-blue, flushed light purple towards apex; eye white and yellow; spur of medium length, sparsely hairy; July 3. Raised by sender.

164. Lavender (Barr).—Height 4 feet 6 inches; spike loose, tapering, 12 to 15 inches; flowers small, sky-blue, faintly streaked purple; eye white and yellow; spur long; June 12. Of Dutch origin; introduced by Messrs. Barr.

187. Lorna Doone (Barr).—Height 6 feet; spike fairly loose, tapering, 24 inches, branch spikes fairly numerous; flowers large, sky-blue, slightly suffused, light purple; eye purplish white and yellow, spur fairly long, June 25. Some flowers with extra light purple petal. Raised by Messrs. Barr.

178. Monarch (Forbes).—Height 6 feet 6 inches; spike crowded, tapering, 10 inches, branch spikes fairly numerous; flowers small, sky-blue, some petals suffused purple; eye white and yellow; spur long, sparsely hairy; July 2. Spikes crooked. Raised by sender.

210. Star of Langport (Kelway).—Height 5 feet 6 inches; spike loose, tapering, 18 inches; flowers of medium size, sky-blue, purplish streak in centre; eye greenish yellow; spur long; June 28. Some semi-double. Raised by sender.

173. Sordello (Barr).—Height 4 feet 3 inches; spike loose, tapering, 14 inches; flowers rather small, sky-blue, some petals suffused light purple; eye greenish yellow, spur rather short; June 27.

208. Yvette Guilbert (Blackmore & Langdon).—Height 6 feet 6 inches; spike loose, tapering, 24 inches, branch spikes numerous; flowers large, sky-blue and light purple; eye white and yellow; spur long, sparsely hairy; June 28.

(2) Eye Dark.

92. Dawn (Kelway), **XXX** July 5, 1917.—Height 5 feet; spike fairly loose, tapering, 18 inches; branch spikes fairly numerous; flowers of medium size, light sky-blue, slightly suffused mauve-purple; eye purplish sepia and gold; spur long, sparsely hairy; June 25. Distinct, one taller, dark indigo. Raised by senders, 1915.

93. The MacLain of Lockbuie (Kelway).—Height 5 feet 6 inches; spike crowded, tapering, 12 inches; flowers of medium size, sky-blue tinged purple; eye sepia and gold; spur short, sparsely hairy; July 2. Raised by sender, 1915.

II. *Dark Blue.*

(1) Eye Light.

144. Blue Prince (Barr).—Height 6 feet 6 inches; spike loose, tapering, 27 inches; flowers of medium size, indigo suffused purple; eye white and yellowish; spur long, sparsely hairy; June 18. Some flowers more purple and crowded. Raised by sender.

57. Candidat (Baker).—Height 6 feet; spike loose, tapering, 20 inches, branch spikes numerous; flowers small to medium, indigo, purple margins, lighter in centre; eye white and yellow; spur long; June 20. Raised by Mr. van Veen.

212. China Blue (Kelway).—Height 4 feet 10 inches; spike rather close, blunt, 5 inches, interrupted below; flowers semi-duplex, fairly large, indigo, paler in centre; eye white and yellow; spur short, sparsely hairy; June 13. Raised by sender, 1910.

143. Ditton Blue (Barr).—Height 6 feet; spike loose, tapering, 20 inches; flowers of medium size, indigo suffused purple margins; eye white and yellowish; spur medium; June 18. Some plants dwarfer with blunt. Raised by sender.

107, 108. Duke of Connaught (Barr, Kelway).—Height 6 to 7 feet; spike fairly loose, tapering, 22 to 24 inches; flowers single and semi-double, of medium to large size, indigo suffused purple; eye whitish; spur of medium length; June 18. No. 108 had more numerous branch spikes and some dark-eyed flowers, and No. 107 some crooked spikes. Raised by Messrs. Kelway, 1905.

213. Geraldine Kelway (Kelway).—Height 5 feet 6 inches; spike loose, tapering, 20 inches; flowers of medium size, indigo suffused dull purple at margins; eye white and yellow; spur long; June 28. Raised by sender, 1912.

21. Kingston King (Smith).—Height 5 feet; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers of medium size, royal blue suffused purple; eye greenish yellow; spur long, sparsely hairy; June 13. Introduced by sender.

61. K. Th. Caron (Ruys).—Height 5 feet 3 inches; spike loose, tapering, 14 inches; flowers large, indigo, streaked lighter, suffused purple margins; eye white and yellow; spur long; June 25. One plant with blunt, crowded spikes and branch spikes, like 'Masterpiece,' which has broader foliage.

155. Lady Maud Warrender (Forbes).—Height 5 feet 6 inches; spike fairly loose, tapering, 16 inches; branch spikes numerous; flowers small, indigo, side petals suffused purple; eye cream and yellow; spur long, sparsely hairy; June 30. Raised by sender, 1906.

12, 13. Lamartine (Barr, Ruys), **A.M.** July 20, 1917.—Height 4 feet 3 inches; spike loose, tapering, 18 inches, branch spikes fairly numerous; flowers small, ultramarine, suffused purple, streaked indigo; eye whitish; spur long; June 30. Introduced by Messrs. Barr.

65. Masterpiece (Barr).—Height 5 feet 6 inches; spike crowded, blunt, 17 inches, branch spikes rather numerous; flowers large, indigo, suffused purple margins; eye white and yellow; spur long; June 25. Very like 'K. Th. Caron,' but blunt spikes, more numerous branch spikes and broader foliage. Raised by sender.

37. Mrs. Trumperant Potts (Baker).—Height 6 feet; spike crowded, tapering, 24 inches; flowers small, indigo, faintly purple at margins; eye cream and yellow; spur long; June 18. Raised by sender; a seedling of 'Mme. Violet Gueslin,' 1910.

60. Mrs. T. G. Baker (Baker), **XXX** July 5, 1917.—Height 5 feet 9 inches; spike crowded, tapering, 16 to 24 inches; flowers large, indigo, streaked dull red-purple; eye yellowish white; spur long; June 21. Raised by sender, 1912.

179. N. F. Barnes (Forbes).—Height 6 feet; spike crowded, tapering, 12 inches; flowers indigo, slightly streaked purple; eye white and yellow; spur rather short, sparsely hairy; July 3. Raised by sender, 1913.

152. Nansen (Forbes).—Height 6 feet; spike crowded, tapering, 18 inches, branch spikes long, numerous; flowers single and semi-double, large, sky-blue, slightly suffused purple; eye yellow and purplish white; spur long, sparsely hairy; June 26. Raised by sender, 1905.

66. Oxonian (Barr).—Height 4 feet; spike fairly loose, tapering, 12 inches; flowers rather small, indigo, with darker streaks; eye purplish white and yellow; spur long, June 18. Slightly lighter than Nos. 68 and 70, and dwarfer. Raised by sender.

47. Rt. Hon. A. E. Fellowes (Kelway), **XX** July 5, 1917.—Height 7 feet 6 inches to 8 feet; spike loose, tapering, 30 inches, branch spikes rather numerous; flowers large, indigo, suffused purple; spur long, sparsely hairy; June 25. Raised by sender, 1907.

95. Splendour (Kelway).—Height 6 feet; spike fairly loose, tapering, 20 inches; branch spikes long and numerous; flowers large, indigo, suffused purple margins; eye white and yellow; spur long, stout; June 25. Raised by sender, 1913.

34. Steeple (Forbes).—Height 2 feet 3 inches; spike loose, tapering, 18 inches, branch spikes numerous; flowers large, indigo, broad purple margins; eye cream and yellow; spur long, sparsely hairy; June 25. Raised by sender.

(2) Eye Dark.

53. Apemantes (Barr).—Height 6 feet; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers small to medium, indigo streaked purple; eye sepia and yellow; spur of medium length, sparsely hairy; June 18.

150. Countess of Leitrim (Kelway).—Height 5 feet; spike loose, tapering, 16 inches, branch spikes fairly numerous; flowers large, indigo, suffused purple margins; eye sepia and gold; spur fairly long, sparsely hairy; June 25. A few flowers with one extra petal. Raised by sender.

4. Garth (Forbes).—Height 6 feet; spike loose, tapering, 21 inches, branch spikes numerous; flowers of medium size, sky-blue, suffused light purple; eye sepia and gold; spur of medium length; July 1. A few semi-double flowers. Raised by sender.

19, 50. Macbeth (Hill, Bunyard), **XXX** July 5, 1917.—Height 4 feet 9 inches to 5 feet; spike crowded, tapering, 18 to 24 inches, branch spikes fairly numerous; flowers small to medium, indigo, purplish towards apex, outside ultramarine, nearly a self; eye purple and gold; spur long, June 13. No. 19 was sent in as 'Gentian Blue,' raised by Capt. V. Hill in 1913, but 'Macbeth,' raised by Messrs. Bunyard, 1910, is the older plant and name.

149. Spire (Forbes).—Height 5 feet; spike loose, tapering, 20 inches; flowers single and semi-double, small, indigo, slightly suffused purple (one purple petal); eye sepia and yellow; spur of medium length, sparsely hairy; June 25. Buds shining ultramarine. Raised by sender.

B. Flowers Semi-double (Duplex).

I. *Light Blue.*

(1) Eye Light.

118. Bassanio (Bunyard).—Height 6 feet 6 inches; spike crowded, tapering, 21 inches; flowers large, sky-blue, suffused mauve-purple towards apex; eye white and yellow; spur long, sparsely hairy; June 27. Raised by sender.

194. Belladonna semiplenum (Ruys).—Height 4 feet; spike loose, tapering, 48 inches, branch spikes numerous; flowers of medium size, light indigo, suffused purple at apex; eye yellow-green; spur long; June 18.

104. Capt. Smith Neil (Forbes).—Height 6 feet 6 inches; spike crowded, tapering, 24 inches; flowers large, light dull purple, sky-blue margins; eye greenish; spur fairly long, sparsely hairy; July 9. Flowers of striped appearance. Raised by sender.

5, 7. Daniel Osiris (Blackmore & Langdon, Ruys), **XXX** July 20, 1917.—Height 5 feet 6 inches; spike crowded, tapering, 24 inches, branch spikes strong, numerous; flowers large, indigo, suffused purple streak on each petal; eye greenish; spur long, sparsely hairy; July 7. Raised by M. Lemoine.

166. Dr. Lodwidge (Kelway), **XXX** July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 24 inches; flowers small, indigo, purplish centre; eye green; spur rather short, sparsely hairy; June 25. Raised by sender.

9. Edwin Beckett (Baker), **XXX** July 5, 1917.—Height 6 feet to 6 feet 6 inches; spike loose, tapering, 24 inches; flowers large, indigo, suffused purple; eye sepia and greenish white; spur of medium length, sparsely hairy; June 20. One plant dwarfer with duller flowers and dense spikes.

168, 169. Elsie (Blackmore & Langdon, Barr).—Height 5 feet 9 inches; spike rather crowded, tapering, 18 inches, branch spikes fairly numerous; flowers large, sky-blue, suffused purple in centre; eye greenish white; spur of medium length; June 25.

67. Galicia (Baker), **XXX** July 5, 1917.—Height 6 feet 8 inches; spike rather crowded, 20 inches; flowers large, indigo, purple towards apex; eye white and purple; spur long, sparsely hairy; June 25. Raised by Mr. Smith; a seedling from 'Alake,' 1911.

129. Glory (Blackmore & Langdon).—Height 5 feet; spike rather crowded, tapering, 2 feet; flowers of medium size, light purplish mauve (lavender); spur long; June 18. Raised by Mr. van Veen.

217. Glory of Edentown (Fairbairn).—Height 2 feet 8 inches; spike loose, tapering, 8 inches, branch spikes fairly numerous; flowers large, sky-blue, suffused purple-mauve; eye white and green; spur rather short; June 18. Spike probably longer when well grown. Raised by sender, 1912.

197. Hugo Poortman (Ruys).—Height 6 feet; spike crowded, slightly tapering, 27 inches, branch spikes numerous; flowers large, sky-blue, much suffused light mauve-purple; eye greenish; spur fairly long; June 20. Fine spike. Raised by sender 1905, introduced 1911.

139. Hypatia (Bunyard).—Height 4 feet 9 inches; spike fairly loose, tapering, 16 to 18 inches; flowers large, deep sky-blue, slightly streaked purple, extra petals purple; eye yellowish; spur of medium length; June 22. Flowers irregular in colour. Raised by sender.

83. Ida R. Elliot (Blackmore & Langdon).—Height 5 feet 3 inches; spike loose, rather blunt, 12 inches; flowers large, sky-blue, suffused purple margins; eye greenish; spur long, sparsely hairy; July 9. Raised by Mr. van Veen.

154. James P. Robertson (Forbes).—Height 4 feet 9 inches; spike fairly loose, tapering, 12 inches; branch spikes fairly numerous; flowers of medium size, single and semi-double, indigo, some suffused purple; eye greenish white; spur fairly long; June 28. One plant dwarfer and more purple. Raised by sender.

190. Lady Georgina Legge (Kelway), **A.M.** July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 27 inches; branch spikes numerous; flowers of medium size, royal blue, streaked light purple; eye yellow and green; spur short, sparsely hairy; June 27. Flower almost regular of two series of petals, fine blue. Raised by sender.

132. Lavanda (Blackmore & Langdon).—Height 5 feet; spike crowded, blunt, 18 inches; flowers large, dark sky-blue and light mauve-purple; eye white and green; spur long, sparsely hairy; June 30. Raised by Mr. Ferguson.

153. Lord Kitchener (Forbes).—Height 6 feet; spike rather crowded, tapering, 18 inches, branch spikes long, numerous; flowers large, sky-blue, slightly suffused purple; eye yellow and purplish white; spur long, sparsely hairy; June 20. Raised by sender, 1903.

161. Lorenzo de Medici (Blackmore & Langdon).—Height 5 feet 3 inches; spike fairly loose, in whorls, tapering, 18 inch s; flowers large, sky-blue and mauve-purple; eye yellowish white; spur rather short, sparsely hairy; July 2. Petals pointed and incurved, distinct.

165. Lovely (Kelway), **XXX** July 5, 1917.—Height 7 feet; spike loose, tapering, 26 inches; flowers large, light mauve purple, streaked sky-blue, outer petals strongly suffused; eye white and green; spur rather short; June 22. Raised by sender.

46. Miranda (Bunyard).—Height 4 feet 6 inches; spike rather crowded, tapering, 14 inches; flowers large, indigo and light mauve-purple; eye greenish; spur short; June 20. Raised by sender.

138. Mrs. Brouwer (Blackmore & Langdon).—Height 5 feet 6 inches; spike fairly crowded, rather blunt, 16 inches; flowers large, sky-blue and mauve-purple; eye white and yellow; spur fairly long, sparsely hairy; June 30.

134. Mrs. Colin McIver (Blackmore & Langdon).—Height 6 feet; spike loose, tapering, 20 inches, branch spikes numerous; flowers large, light purple-mauve (lilac); eye white and yellow; spur short; June 18. One plant dwarfer with blunt spikes. Raised by sender.

172. Mrs. Fred Carr (Baker).—Height 4 feet 3 inches; spike fairly loose, slightly tapering, 13 inches; flowers large, sky-blue, suffused light purple; eye greenish yellow; spur rather short, sparsely hairy; June 26. Raised by Mr. Smith.

181. Mrs. James Kelway (Wisley), **XXX** July 5, 1917.—Height 5 feet 3 inches; spike rather crowded, tapering, 14 inches; flowers large, sky-blue flushed purple; eye yellowish white; spur fairly long; June 20. Raised by Messrs. Kelway, 1912.

127. Mrs. Shirley (Blackmore & Langdon), **A.M.** July 5, 1917.—Height 7 feet; spike somewhat crowded, tapering, 24 inches, branch spikes fairly numerous; flowers fairly large, sky-blue, suffused light mauvy-purple; eye white and green; spur short; June 25. The purest mauve. Raised by sender.

137. Nymphe (Barr).—Heig t 3 feet 6 inches; spike crowded, blunt, 9 inches; flowers large, sky-blue, purple streak in centre; eye white; spur short, sparsely hairy; July 10. Raised by sender.

185. Perfection (Blackmore & Langdon), **XXX** July 20, 1917.—Height 6 feet 6 inches; spike crowded, tapering, 14 inches; flowers fairly large, sky-blue, suffused mauve-purple towards apex; eye white and greenish; spur long; July 3. Raised by senders.

84. Porthos (Barr).—Height 6 feet; spike fairly loose, tapering, 24 inches, branch spikes numerous; flowers large, indigo, with purple centre; eye yellowish white; spur rather short, sparsely hairy; June 20. Raised by sender.

171. Queen of Spain (Ruys).—Height 5 feet to 6 feet 6 inches; spike fairly crowded, tapering, 24 inches; flowers large, sky-blue and light mauve-purple; eye greenish yellow; spur of medium length, sparsely hairy; June 12.

103. Rozenlust (Ruys), **A.M.** July 5, 1917.—Height 7 feet; spike rather crowded, tapering, 18 inches, branch spikes fairly numerous; flowers large, sky-blue, suffused mauve-purple; eye greenish; spike fairly long, sparsely hairy June 27. Raised by Mr. W. van Veen.

115. Star of Devon (Godfrey), **XXX** July 5, 1917.—Height 6 feet; spike loose, tapering, 23 inches, branch spikes long, numerous; flowers large, sky-blue, suffused light mauve-purple; eye cream with purple streak; spur of medium length, sparsely hairy; June 25. Raised by sender.

135. Statuaire Rude (Blackmore & Langdon), **XXX** July 20, 1917.—Height 5 feet 3 inches; spike fairly crowded, tapering, 15 inches; flowers large, sky-blue, suffused mauve-purple; eye white and yellow; spur short, sparsely hairy; July 14. Raised by M. Lemoine.

111. Willy Obreen (Ruys).—Height 6 feet 9 inches; spike rather crowded, tapering, 18 inches; flowers large, sky-blue, suffused purple towards apex; eye green; spur long; June 30.

(2) Eye Dark.

125. Amos Perry (Ruys), **XXX** July 5, 1917.—Height 6 feet 3 inches; spike loose, tapering, 24 inches; flowers of medium size, sky-blue, and light mauve-purple; eye yellowish green; spur long; June 18.

31. Ariel (Bunyard).—Height 6 to 7 feet; spike fairly crowded, tapering, 30 inches; flowers large, light sky-blue, suffused purplish mauve; eye sepia; spur long; June 15. Raised by sender.

167. Baroness Henrietta van Thuyll (Blackmore & Langdon).—Height 5 feet; spike loose, tapering, 24 inches; flowers large, sky-blue and light purple centre; eye sepia and yellow; spur short; June 20. Raised by Mr. van Veen.

51. Blue Rocket (Elliott).—Height 5 feet 6 inches; spike fairly crowded, tapering, 20 inches; flowers sky-blue, flushed purple; eye sepia and gold; spur short, sparsely hairy; July 9. Raised by Mr. C. Elliott.

133. Chantry Queen (Blackmore & Langdon).—Height 5 feet; spike crowded, rather blunt, 15 inches; branch spikes fairly numerous; flowers large, dark sky-blue, and light mauve-purple; eye sepia and gold; spur rather short; July 7; spike thickest towards apex. Introduced by senders.

182. Explorateur Flamand (Barr).—Height 5 feet 6 inches; spike crowded, tapering, 17 inches; flowers large, mauve-purple, indigo margins; eye purplish brown and gold; spur long, sparsely hairy; July 7.

186. Kingston Queen (Smith), **A.M.** July 5, 1917.—Height 7 feet 6 inches; spike loose, but inclined to be crowded in lower part, tapering, 32 inches, branch spikes numerous; flowers of medium size, sky-blue suffused from base with light purple; eye greenish, sometimes sepia; spur rather short; June 25. Raised by sender.

114. Lieutenant Delacommune (Blackmore & Langdon).—Height 5 feet, spike rather crowded, somewhat blunt, 13 inches; flowers large, sky-blue, suffused mauve-purple; eye sepia and gold; spur short, sparsely hairy; July 7. Raised by M. Lemoine.

96. Miss Nellie Weyman (Ruys).—Flowers sky-blue and mauve-purple; eye dark; June 25.

8. Monarch of All (Kelway).—Height 7 feet; spike loose, tapering, 30 to 36 inches; flowers large, indigo suffused dull purple; eye greenish sepia and yellow; spur of medium length, sparsely hairy; June 25. Raised by sender, 1912.

120. Mrs. A. J. Watson (Blackmore & Langdon), **A.M.** July 5, 1917.—Height 7 feet; spike somewhat crowded, tapering, 24 inches; flowers large, indigo and lightish purple; eye sepia and yellow; spur fairly long; June 25. Raised by sender.

131. Sergeant Beranger (Blackmore & Langdon), **XXX** July 20, 1917.—Height 6 feet; spike rather crowded, tapering, 12 inches; flowers large light purple, indigo margins; eye sepia and purple; spur long; July 7. Raised by M. Lemoine.

II. *Dark Blue.*

(1) Eye Light.

100, 101. Aeroplane (Barr, Ruys), **XXX** July 5, 1917.—Height 6 feet; spike loose, tapering, 20 inches, branch spikes long, numerous; flowers large, indigo, suffused purple; eye white and yellow; spur short, sparsely hairy; June 25.

122. Andrew Carnegie (Ruys).—Height 7 feet; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers of medium size, indigo, margins suffused dull purple; eye white and yellow; spur fairly long; July 25.

97. Antigone (Ruys).—Height 6 feet; spike rather crowded, somewhat blunt, 18 inches; flowers large, indigo and purple; eye yellow-green; spur long; July 7.

35. Attraction (Forbes), **XXX** July 5, 1917.—Height 7 feet 3 inches; spike loose, tapering, 30 inches; flowers fairly large, indigo suffused purple; eye green and white; spur short, sparsely hairy; June 26. Raised by sender, 1908.

94. Bayardo (Kelway).—Height 7 feet; spike fairly crowded, tapering, 24 inches; flowers of medium size, dark purple with ultramarine margins; eye greenish yellow; spur long, sparsely hairy; July 2. One plant dwarf, hoary when young, with small flowers. Raised by sender.

87. Blue Gem (Barr).—Height 3 feet; spike lax, interrupted, tapering, 17 inches, branch spikes numerous; flowers large, irregular, indigo streaked and suffused purple; eye white; spur long; June 27. Raised by sender.

10. Chamud (Ruys).—Height 6 feet 6 inches; spike fairly crowded, slightly tapering, 24 inches, branch spikes slender, medium; flowers large, indigo and purple; eye greenish white and sepia; spur of medium length; June 14. One plant slender, much dwarfer and with less cut leaves. Raised by M. Lemoine.

102. Colonel Crabbe (Wisley).—Height 6 feet 6 inches; spike rather crowded, tapering, 24 inches; flowers large, indigo and purple with deeper margins; eye greenish white; spur rather short; June 15.

112. Cymbeline (Wisley).—Height 6 feet 6 inches; spike fairly crowded, tapering, 24 inches; branch spikes numerous; flowers of medium size, indigo and purple; eye greenish, some white; spur fairly long; June 18.

16. De Ruyter (Ruys).—Height 6 feet; spike rather crowded, tapering, 23 inches; branch spikes numerous; flowers of medium size, indigo and purple; eye yellowish and white: spur of medium length; sparsely hairy; June 26.

109. Dr. Bergman (Wisley).—Height 5 feet; spike loose, tapering, 18 inches; branch spikes long, fairly numerous; flowers large, indigo, heavily suffused purple apex and margins; eye cream and purple; spur fairly long, sparsely hairy; June 27.

58. F. Carr (Kelway).—Height 5 feet 6 inches; spike rather crowded, tapering, 20 inches; flowers large, indigo and dull red purple; eye cream and yellow; spur short; June 18. Raised by sender.

20. Francis F. Fox (Ruys).—Height 5 feet; spike loose, tapering, 24 inches; flower large, indigo suffused purple; eye white; spur fairly long; June 21.

40. James William Kelway (Kelway).—Height 6 feet to 6 feet 6 inches; spike loose, tapering, 24 inches; flowers large, purple, tipped indigo; eye yellowish white; spur of medium length; June 25. Raised by sender, 1912.

27, 28. King of Delphiniums (Barr, Ruys).—Height 4 feet 6 inches to 6 feet 6 inches; spike loose, tapering, 27 inches; flowers large, indigo and purple, eye cream and yellow; spur short; June 20.

98. Lord Curzon (Blackmore & Langdon), **XXX** July 5, 1917.—Height 5 feet 3 inches; spike fairly crowded, semi-blunt, 16 inches; branch spikes weak, short, numerous; flowers large, dark indigo and dark purple, ultramarine outside; eye cream and yellow; spur short; June 29. Buds very dark, shining. Raised by senders.

39. Lord Rosebery (Barr).—Height 5 feet; spike crowded, rather blunt, 8 inches; flowers of medium size, dull red purple, ultramarine margins; eye sepia and gold; spur short; sparsely hairy; July 7.

113. Marion Riddle (Forbes).—Height 6 feet 6 inches; spike crowded, rather blunt, 15 inches; flowers large, dull purple, indigo margins; eye cream and yellow; spur long, sparsely hairy; July 7. Raised by sender, 1913.

81. Miss Britton (Barr), **XX** July 5, 1917.—Height 7 feet 6 inches; spike crowded, slightly tapering, 12 inches; flowers of medium size, indigo, suffused purple; eye white and yellow; spur short, sparsely hairy; July 6. Raised by sender.

6. Mme. E. Geny (Wisley).—Height 6 feet 6 inches; spike rather crowded, tapering, 18 inches, branch spikes long, numerous; flowers large, indigo and purple; eye cream and yellow; spur long, sparsely hairy; June 26.

79. Mrs. O'Connor (Baker).—Height 5 feet 6 inches; spike loose, tapering, 24 inches, branch spikes numerous; flowers of medium size, indigo, suffused purple; eye greenish; spur rather short; June 27. Raised by sender.

11. Mrs. Violet Hulton (Baker).—Height 6 feet 3 inches; spike fairly crowded, slightly tapering, 22 inches, branch spikes fairly numerous; flowers large, indigo and purple; eye greenish and white; spur fairly long; June 25. Raised by Mr. Smith.

158. Nerissa (Bunyard).—Height 5 feet 6 inches; spike rather crowded, tapering, 16 inches; flowers of medium size, waved, indigo, faintly streaked light purple; eye yellowish white; spur short; June 12. Raised by sender.

52. Nobilis (Baker), **XXX** July 20, 1917.—Height 7 feet; spike crowded, tapering, 20 inches, branch spikes fairly numerous; flowers large, indigo, suffused purple more or less; eye greenish white; spur long; July 7.

48. Purple Rod (Kelway).—Height 4 to 6 feet; spike rather crowded, some tapering, some blunt, 18 to 21 inches, branch spikes, some numerous; flowers

dark purple and indigo; eye yellow and white; spur of medium length, some sparsely hairy; June 18. Mixed single and duplex, dark and light in colour. Raised by sender, 1912.

23. Prins Hendrik (Ruys).—Height 4 feet 6 inches; spike fairly crowded, rather blunt, 18 inches; flowers large, purple, indigo margins; eye cream; spur long; July 6.

38. Remarkable (Kelway).—Height 6 feet 6 inches; spike rather crowded, tapering, 24 inches, branch spikes rather numerous; flowers large, indigo, suffused purple, lighter in centre, eye greenish and white; spur short; June 26. Raised by senders.

30. Shylock (Bunyard).—Height 5 feet 6 inches; spike rather crowded, slightly tapering, 20 inches, branch spikes fairly numerous; flowers large, deep mauve on blue; eye cream and purple; spur long, sparsely hairy; June 26. One plant with broadly-lobed leaves. Raised by senders.

44. Sir Wroth Lethbridge (Kelway).—Height 6 feet; spike fairly loose, tapering, 18 inches, branch spikes rather numerous; flowers large, indigo, much purple at margins, some all purple; eye white and yellow; spur short; June 21. Raised by senders.

56. Stateliness (Barr).—Height 5 feet 6 inches; spike rather crowded, slightly blunt, 11 inches, branch spikes fairly numerous; flowers small, Antwerp blue, extra petals suffused dark purple; eye white and yellow; spur long; buds ultramarine, shining; July 7. Raised by sender.

25, 26. The Alake (Ruys, Baker).—Height 6 to 7 feet; spike fairly loose, tapering, 24 inches, branch spikes long, numerous; flowers large, indigo and purple; eye white and greenish; spur rather short; June 26.

15. T. Thomas (Blackmore & Langdon).—Height 4 feet 3 inches; spike loose, tapering, 12 inches, branch spikes fairly numerous; flowers of medium size, indigo and purple; eye yellowish and white; spur of medium length; July 2. Raised by sender.

156. Turquoise (Blackmore & Langdon).—Height 5 feet 3 inches; spike loose, tapering, 22 inches, branch spikes numerous; flowers of medium size, deep sky-blue, suffused purple; eye greenish white; spur fairly long; July 2.

43. Walter T. Ware (Blackmore & Langdon).—Height 6 feet 6 inches; spike fairly loose, tapering, 26 inches, branch spikes long, fairly numerous; flowers large, dull purple tipped indigo; eye whitish; spur of medium length; July 21. Raised by senders.

(2) Eye Dark.

157. Ampère (Blackmore & Langdon).—Height 5 feet; spike crowded, blunt, 14 inches, branch spikes numerous; flowers fairly large, indigo, suffused purple from apex; eye sepia and gold; spur short; July 7. Raised by M. Lemoine.

170. Arago (Lissadell).—Height 4 feet 9 inches; spike fairly loose, tapering, 15 inches, branch spikes numerous; flowers large, indigo, suffused purple at margins; eye purple and cream; spur short, sparsely hairy; June 30. Raised by M. Lemoine.

106. Corry (Ruys), XXX July 5, 1917.—Height 7 feet 6 inches; spike loose, tapering, 36 inches; flowers large, indigo and purple; eye sepia and yellow; spur short, sparsely hairy; June 18. Raised by Mr. F. Koppins.

117. Dusky Monarch (Kelway).—Height 6 feet 6 inches; spike rather crowded, tapering, 19 inches; flowers fairly large, indigo, suffused dull purple; eye sepia and gold; spur fairly long, sparsely hairy; June 27. Raised by senders.

199. Eva (Blackmore & Langdon).—Height 5 feet 6 inches; spike crowded, tapering, 18 inches; flowers large, deep sky-blue, suffused purple; eye sepia and gold; spur of medium length; June 20. Two plants slender and dwarfer. Raised by sender.

183, 184. Harry Smetham (Ruys, Blackmore & Langdon), A.M. July 5, 1917.—Height 6 feet 6 inches; spike fairly loose, tapering, 24 inches, branch spikes numerous; flowers of medium size, indigo, suffused purple centre; eye greenish white; spur short; June 25. Symmetrical flowers of about four whorls. Raised by Messrs. Blackmore & Langdon.

3. Henri Moissan (Blackmore & Langdon).—Height 5 feet 6 inches; spike rather crowded, tapering, 18 inches, branch spikes numerous; flowers large, indigo, much suffused dark purple; eye sepia and yellow; spur long; July 1. Raised by M. Lemoine.

116. In Remembrance (Barr).—Height 6 feet 6 inches; spike crowded, tapering, 18 inches, branch spikes weak, numerous; flowers large, deep indigo, suffused dull purple; eye greenish white; spur long; June 30. Introduced by sender.

71. Jessica (Wisley).—Height 3 feet; spike rather crowded, blunt, 9 inches; flowers small, dull indigo, suffused dull light purple; eye greenish; spur short, sparsely hairy; June 30.

78. J. S. Sargent (Wisley).—Height 5 feet; spike a bit crowded, tapering, 24 inches; flowers of medium size, indigo and dark purple, suffused ultramarine; eye sepia and yellow; spur long; June 25.

110. Lady Nina Balfour (Forbes).—Height 6 feet; spike rather crowded, tapering, 21 inches, branch spikes long, numerous; flowers large, dark indigo, suffused purple; eye sepia and gold (some cream); spur rather short; June 27. Most spikes tend to be fascinated. Raised by senders.

74, 75. Novelty (Blackmore & Langdon, Ruys), **XXX** July 5, 1917.—Height 5 feet 6 inches; spike crowded, rather blunt, 22 to 36 inches; flowers indigo, suffused purple; eye sepia and gold; spur short; June 30. No. 74 was the best stock. Raised by Messrs. Blackmore & Langdon.

72. Princess Juliana (Barr).—Height 2 feet 4 inches; spike fairly loose, tapering, 18 inches; branch spikes rather numerous; flowers large, ultramarine, suffused dark purple; eye sepia and gold; spur rather short, sparsely hairy; June 25.

128. Progenitor (Forbes).—Height 7 feet; spike loose, tapering, 30 inches; branch spikes fairly numerous; flowers of medium size, indigo, streaked warm purple, lighter centre; eye sepia and gold; spur of medium length; June 25. Raised by sender, 1905.

41, 42. Robert Cox (Barr, Blackmore & Langdon), **XXX** July 5, 1917.—Height 6 feet 6 inches; spike rather crowded, tapering, 24 inches; flowers of medium size, deep indigo and dark purple; eye sepia and yellow; spur long; June 25. Raised by Messrs. Blackmore & Langdon.

45. Rosalie Ingram (Forbes).—Height 7 feet; spike loose, tapering, 24 inches, branch spikes numerous; flowers large, indigo, suffused purple; eye sepia and gold; spur short, sparsely hairy; June 27. Raised by sender, 1913.

1. Smoke of War (Kelway).—Height 5 feet; spike loose, tapering, 20 inches; flowers of medium size, indigo, much suffused dark purple; eye sepia and yellow; spur of medium length, sparsely hairy; June 26. One plant not true. Raised by sender.

136. Ustane (Barr).—Height 5 feet 6 inches; spike loose, tapering, 22 inches; flowers of medium size, royal blue and purplish centre; eye sepia and yellow; spur of medium length; June 6. One plant dwarf and slender.

18. Zuster Lugten (Ruys).—Height 4 feet; spike rather crooked, loose, tapering, 18 inches, branch spikes rather numerous; flowers fairly large, indigo and dark purple; eye sepia and yellow; spur long, sparsely hairy; June 26. Raised by sender.

C. Flowers Double.

I. *White or Yellow.*

(1) White.

220. Darius (Wisley).—Height 2 feet 8 inches; spike crowded, blunt, 6 inches; flowers of medium size, cream; eye greenish yellow; spur short; June 27.

(2) Pale Lemon.

224. Frõken Scheltema (Ruys).—Height 2 feet 3 inches; spike fairly loose, blunt, 12 inches; flowers large, pale lemon; eye yellow; spur short, sparsely hairy; June 30. Raised by M. Hemerik.

222. Luna (Baker), **XXX** July 5, 1917.—Height 4 feet; spike fairly loose, tapering, 18 inches; branch spikes stout, fairly numerous; flowers large, pale lemon; eye yellow; spur short, sparsely hairy; June 27. Raised by Mr. Smith, 1913.

223. Progression (Ruys), **XXX** July 5, 1917.—Height 4 feet; spike fairly loose, tapering, 18 inches, branch spikes stout, fairly numerous; flowers large, pale lemon; spur short, sparsely hairy; June 25. Rather more double than 222.

II. *Light Blue.*

(1) Eye Light.

80. Ma Mie, syn. Princess Royal (Barr), **XXX** July 5, 1917.—Height 6 feet 6 inches; spike fairly crowded, tapering, 24 inches; flowers large, indigo and purple; eye greenish; spur long; June 30. Introduced by sender.

151. René Quinton (Blackmore & Langdon).—Height 5 feet; spike fairly crowded, tapering, 12 inches, branch spikes fairly numerous; flowers fairly large, dull sky-blue and white, streaked purple; eye purplish white; spur short, sparsely hairy; July 14. Raised by M. Lemoine.

32. Rev. E. Lascelles (Baker), **XXX** July 5, 1917.—Height 5 feet 4 inches; spike loose, tapering, 20 inches; branch spikes rather numerous; flowers of medium size, purple with indigo margins; eye white, mottled purple; spur short; June 27.

(2) Eye Dark.

73. King Bladud (Blackmore & Langdon).—Height 5 feet; spike rather crowded, slightly blunt, 12 inches, branch spikes numerous; flowers large, dull purple, Antwerp blue margins; eye purple; spur short; July 6. A sport from Rev. E. Lascelles, raised by Messrs. Blackmore & Langdon.

54. Telegram (Barr).—Height 4 feet; spike rather crowded, crooked, slightly blunt, 12 inches; branch spikes numerous; flowers of medium size, very double, with closely imbricated narrow petals, dull indigo with purple centre; eye yellowish; spur short, sparsely hairy; June 26. Many main spikes crooked, becoming subsidiary to side spikes.

III. *Dark Blue.*

(1) Eye Light.

130. Lieutenant Vasseur (Blackmore & Langdon).—Height 5 feet 4 inches; spike crowded, solid, blunt, 12 inches; flowers of medium size, sky-blue margins, suffused mauve-purple base; spur short; July 7. The most perfect and regular double. Raised by M. Lemoine.

(2) Dark Eye.

85. Diamant (Barr).—Height 5 feet; spike crowded, tapering, 15 inches, branch spikes rather numerous; flowers small, dark indigo and purple; eye dull purple and yellow; spur fairly long; June 18.

MYOSOTIS AT WISLEY, 1917.

One hundred and one stocks of Myosotis were received for trial at Wisley in 1916. They were sown outdoors in July and transplanted to their permanent quarters 12 × 15 in. apart as soon as large enough. A considerable number failed to germinate, viz. Nos. 4, 6, 13, 19, 22, 26–29, 31, 36, 37, 40–42, 44, 60, 61, 68, 69, 73–75, 78, 89, 98; and of some others but few plants were secured. These are noted below. The winter of 1916–17 was very severe, but almost all stood well and flowered freely in May. In the few cases where damage was done by the winter cold note is made below.

The Floral Committee examined the trial on May 17 and made the following recommendations for awards:

Award of Merit.

No. 82. Indigo Queen, sent by Messrs. Sydenham.

Highly Commended.

Nos. 3, 9, 11, 12, 14. *alpestris stricta*, White Gem, sent by Messrs. Bowers, Carter, Barr, Hurst, and Hurst (for synonyms see descriptions below).

Nos. 15, 16, 17. Perfection Rose, sent by Messrs. Sutton, Barr, and Barr (for synonyms see descriptions below).

No. 23. Pink Gem, sent by Messrs. Sutton.

No. 62. Bouquet Blue, sent by Messrs. Sutton.

No. 63. Blue Eyes, sent by Messrs. R. Veitch.

No. 83, Indigo Queen, sent by Rev. J. Jacob.

No. 87. Royal Blue, sent by Messrs. Sutton.

Varieties.*

1., 2. } Traversii.
3. White Pearl.
4. Argentina.
5., 6. } dissitiflora alba.
7. White Lady.
8. robusta grandiflora alba.
9. Pyramid White.
10. sylvatica alba.
11. stricta White Gem.
12. alpestris stricta alba.
13., 14. } alpestris alba.
15. Perfection Rose.
16. Victoria Rose.
17. Rosy Gem.
18. sylvatica rosea.
19., 20. } alpestris rosea.
21. alpestris stricta rosea.
22. stricta Pink Gem.
23. Pink Gem.
24. Bouquet Pink.
25. Pyramid Pink.
26., 27. } Welwitschii.
28. stricta Tom Thumb.
29. alpestris stricta Tom Thumb Sky Blue.
30. Sky Blue.
31. rupicola.
32A. alpestris blue.
32B., 33., 34. } alpestris Victoria.

* See footnote, p. 107.

35. alpestris robusta grandiflora.
36. alpestris robusta grandiflora, Improved.
37., 38. Queen Victoria.
39., 40., 41., 42. Star of Love.
43. Dwarf Blue.
44. dissitiflora Blue Gem.
45., 46., 47., 48. dissitiflora.
49. dissitiflora (type).
50. dissitiflora.
51. dissitiflora Blue.
52. dissitiflora Perfection.
53. dissitiflora grandiflora Perfection.
54. Perfection Blue.
55. sylvatica.
56. sylvatica (type).
57. Alpine Blue.
58. Triumph.
59. Spring Beauty.
60., 61. oblongata perfecta.
62. Bouquet Blue.
63. Blue Eyes.
64., 65. alpestris stricta coelestina.
66. stricta grandiflora.
67. Blue Gem.
68., 69. azorica.
70. Azure Blue.
71. Azure Blue, No. 2.
72. Pyramid Blue.
73., 74., 75., 76. Ruth Fischer.
77. Warley Blue.
78. Elfriede.
79. stricta Blue Beauty (Pillar Forget-me-not).
80. Blue King.
81. Indigo Blue.
82., 83. alpestris Indigo Queen.
84., 85. Royal Blue.
86., 87. Royal Blue.
88. Royal Blue.
89. New Double Blue.
90., 91. palustris (type).
92., 93., 94., 95., 96. palustris semperflorens grandiflora.
97. Unnamed.
98. Severndroog Turquoise, No. 2.
99. Severndroog Dwarf, No. 1.
100. Waterside Beauty.

I. Flowers Yellow.

1, 2. *Traversii* (R. Veitch, Barr).—Length 5 inches; spreading flat on soil; foliage narrow, blunt, hispid, dull green; inflorescence close; flowers small, yellow. Began to flower May 29, but heavy rains cut short its flowering period and it soon failed.

II. Flowers White.

a. Habit erect.

3, 9, 11, 12, 14. *alpestris stricta* White Gem (Bowers, Carter, Barr, Hurst, Hurst), **XXX** May 17, 1917.—Height 6 to 12 inches; foliage narrow, light yellow green; inflorescence close; flowers $\frac{1}{3}$ inch, white, yellow eye; corolla flat; flowering from May 9. No. 3 was sent in as 'White Pearl,' and 9 as 'Pyramid White,' 12 as *alpestris stricta alba*, and 14 as *alpestris alba*.

b. Habit spreading.

5. ***dissitiflora alba*** (Daniels).—Height 7 to 8 inches; foliage broad, light green; inflorescence long, loose; flowers $\frac{1}{2}$ inch, white, yellow eye, corolla flat, petals deeply lobed; flowering from May 3.

8. ***robusta grandiflora alba*** (Barr).—Height 8 to 9 inches; foliage narrow, light yellow green; inflorescence close; flowers $\frac{3}{8}$ inch, white, yellow eye; corolla flat; flowering from May 7. Mixed, one blue, some doubles.

10. ***sylvatica alba*** (Barr).—Height 5 to 6 inches and 9 to 10 inches; foliage of medium width; inflorescence close; flowers $\frac{3}{8}$ inch, white, yellow eye; flowering from May 9. Only two plants, one much more robust with broader leaves.

7. White Lady (Barr).—Height 8 to 9 inches; foliage narrow, light yellow green; inflorescence close; flowers $\frac{3}{8}$ inch, white, yellow eye; corolla flat, petals emarginate; flowering from May 8. Mixed, one blue, one sparingly hairy, some double.

III. Flowers Pink.

a. Habit erect.

21. *alpestris stricta rosea* (Hurst).—Height 10 to 14 inches; foliage, some narrow, some broad; inflorescence spreading; flowers $\frac{1}{3}$ inch, pink, yellow eye; corolla flat; flowering from May 7. Mixed, erect and spreading.

24. Bouquet Pink (Sutton).—Height 8 to 9 inches; foliage narrow; inflorescence spreading; flower $\frac{1}{3}$ inch, pink, yellow eye; corolla flat; flowering from May 7.

15, 16, 17. Perfection Rose (Sutton, Barr, Barr), Nos. 15 and 16 **XXX** May 17, 1917.—Height 5 to 6 inches; foliage narrow; inflorescence close; flowers $\frac{3}{8}$ inch, pink, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Some double flowers. No. 17 was rather taller, and sent in as 'Rosy Gem.' No. 16 was sent in as 'Victoria Rose.'

23. Pink Gem (Sutton), **XXX** May 17, 1917.—Height 9 to 10 inches; foliage narrow; inflorescence close; flowers $\frac{3}{8}$ inch, pink, yellow eye; corolla flat; flowering from May 7. Some double.

25. Pyramid Pink (Carter).—Height 9 to 10 inches; foliage, some narrow, some broad; inflorescence spreading; flowers $\frac{1}{3}$ inch, pink, yellow eye; corolla flat; flowering from May 9.

b. Habit spreading.

20. *alpestris rosea* (Hurst).—Height 8 to 12 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{4}$ inch, pink, yellow eye; corolla flat; flowering from May 5. Same becoming pale blue.

18. *sylvatica rosea* (Barr).—Height 8 to 12 inches; inflorescence spreading; flowers $\frac{1}{4}$ inch, pink, yellow eye; corolla flat; flowering from May 5. One white, some becoming light blue.

IV. Flowers Pale Blue.

a. Habit erect.

64, 65. *alpestris stricta coelestina* (Hurst, Barr).—Height 10 to 12 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{3}$ inch, sky blue, yellow eye; corolla flat; flowering from May 7. No. 64 was taller, some spreading, and the flowers were pink, becoming sky blue.

67. Blue Gem (Sutton).—Height 8 to 13 inches; foliage, some broad, some narrow; inflorescence close; flowers $\frac{3}{8}$ inch, sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Mixed, some erect, some spreading.

62. Bouquet Blue (Sutton), **XXX** May 17, 1917.—Height 12 inches, foliage narrow; inflorescence spreading; flowers $\frac{3}{8}$ inch, sky blue, yellow eye; corolla flat; flowering from May 5.

54. Perfection Blue (Sutton).—Height 8 to 9 inches; foliage broad; inflorescence close; flowers $\frac{3}{8}$ inch, sky blue, yellow eye, dark throat; corolla flat; flowering from May 7. Some double.

72. Pyramid Blue (Carter).—Height 12 to 14 inches; foliage broad; inflorescence spreading; flowers pink, then sky blue, yellow eye; flowering from May 5. Mixed, some erect, some spreading.

66. *stricta grandiflora* (Barr).—Height 7 to 11 inches; foliage broad; inflorescence close; flowers $\frac{3}{8}$ inch; pink, then sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Mixed; a few doubles, one white, some erect, some spreading.

b. Habit spreading.

32A, 32B. *alpestris* Blue (Hurst, Sydenham).—Height 10 to 13 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{3}$ inch, pink, then sky blue, yellow eye; corolla flat; flowering from May 5. No. 32B was sent in as 'Victoria.'

33, 34, 35, 38. *alpestris* Victoria (Hurst, R. Veitch, Hurst, Barr).—Height 8 to 12 inches; foliage broad; inflorescence close; flowers $\frac{3}{8}$ inch, sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. No. 33 had some double, but mixed with *stricta*; and No. 34 had four spreading rogues. No. 35 was more pink when young; sent in as *robusta grandiflora*.

45, 46, 47, 48, 49, 50, 51. *dissitiflora* (Carter, Barr, R. Veitch, Sydenham Hurst, Daniels, Sutton).—Height 9 to 10 inches; foliage broad, light green;

inflorescence, long, loose; flowers ⅜ inch, pinkish, then sky blue, yellow eye; corolla flat, petals deeply lobed; flowering from May 5. No. 49 was sent in as the type, and was the best stock.

52, 53. *dissitiflora* Perfection (R. Veitch, Barr).—Same as Nos. 45 to 51, but No. 53 suffered a good deal from frost.

43. Dwarf Blue (Sutton).—Dwarf, height 5 to 6 inches; foliage broad, dark shining green; inflorescence close; flowers ¼ inch, pinkish, then light sky blue, yellow eye, dark throat, becoming whitish; corolla concave; flowering from May 7.

90, 91, 92, 93, 94, 95, 96. *palustris* (Hurst, Barr, Barr, Carter, R. Veitch, Daniels, Hurst).—Height 18 to 24 inches; foliage smooth, with few appressed hairs; inflorescence spreading; flowers pinkish, then sky blue, yellow eye; petals sometimes emarginate; flowering from May 26. Nos. 92 and 95 were rather dwarfer. No. 94 rather more slender in stem. Stocks 90 and 91 were sent in as the type, and Nos. 92, 93, 94, 95, 96 as semperflorens.

76. Ruth Fischer (R. Veitch).—Same as No . 45 to 53, but of dwarfer habit.

99. Severndroog Dwarf No. 1 (Bartleet).—Dwarf like No. 76.

30. Sky Blue (Daniels).—Height 12 inches; foliage broad; inflorescence close; flowers ⅓ to ⅜ inch; sky blue, yellow eye; corolla flat, petals emarginate; flowering from May 7. Mixed, some pinkish, some double, some spreading.

59. Spring Beauty (Barr).—Height 9 to 10 inches; foliage broad; inflorescence spreading; flowers ⅓ inch, pinkish, then sky blue, yellow eye ; corolla concave; flowering from May 7.

39. Star of Love (Daniels).—Dwarf, as 76 and 92.

55 *sylvatica* (R. Veitch).—Height 9 to 10 inches; foliage broad; inflorescence close; flowers ⅜ inch, pink, then sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 9. Mixed, some spreading, some decumbent, some double, one white.

56. *sylvatica* type (Barr).—Height 9 to 10 inches; foliage broad; inflorescence spreading; flowers ⅓ inch, pink, then sky blue, dark throat; corolla flat; flowering from May 9. One plant with narrower leaves.

58. Triumph (Barr).—Height 8 to 12 inches; foliage broad; inflorescence close; flowers ⅜ inch; pink, then sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering trom May 9. Mixed, one white, two pink, some double.

100. Waterside Beauty (Bartleet).—Height 9 to 10 inches; foliage broad; inflorescence spreading; flowers ⅓ inch, pink, then sky blue, yellow eye; corolla flat; flowering from May 7. Two white and one erect rogue.

V. Flowers Deep Blue.

Habit spreading.

57. Alpine Blue (Barr).—Height 12 to 13 inches; foliage broad; inflorescence spreading; flowers ⅓ inch pink, then indigo, yellow eye, dark throat; corolla concave; flowering from May 5.

70, 71. Azure Blue (Dobbie, Dobbie).—Height 9 to 11 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye; corolla flat; flowering from May 5. No. 71 had one plant dwarfer with deep pinkish flowers.

63. Blue Eyes (R. Veitch), **XXX** May 17, 1917.—Height 14 inches; foliage broad; inflorescence spreading; flowers ⅜ inch, indigo, yellow eye; corolla flat; flowering from May 5.

80. Blue King (Barr).—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers indigo, yellow eye; corolla concave, petals emarginate; flowering from May 5. One plant sky blue with close inflorescence, and one pinkish blue.

81. Indigo Blue (Daniels).—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers indigo, yellow eye, dark throat; corolla concave, petals emarginate; flowering from May 5. Mixed, one lilac white, one very pale blue; some double.

82, 83. Indigo Queen (Sydenham, Jacob), No. 82 **A.M.** and No. 83 **XXX** May 17, 1917.—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye, dark throat; corolla concave, petals emarginate; flowering from May 5. No. 83 had one sky blue rogue.

84, 85, 86, 87, 88. Royal Blue (Carter, R. Veitch, Hurst Sutton, Bell), No. 87, **XXX** May 17, 1917.—Height 10 to 12 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye; corolla concave, petals emarginate; flowering from May 5. No. 87 was the dwarfer stock.

79. *stricta* Blue Beauty (Barr).—Height 9 to 11 inches; foliage broad; inflorescence close; flowers $\frac{3}{8}$ inch, indigo, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Mixed, one pink, one white, one almost lavender, some double.

97. Unnamed (Tennant).—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye, dark throat; flowering from May 5. One plant with close inflorescence.

77. Warley Blue (Barr).—Height 9 to 13 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{3}$ inch, indigo, yellow eye; corolla concave, some with petals emarginate; flowering from May 5.

ANNUAL POPPIES AT WISLEY, 1917.

Fifty-six stocks of annual poppies were received for trial at Wisley, in 1917. They were sown on March 27 in beds 6 feet wide with a distance of 15 inches between the rows. As soon as large enough they were thinned out to 9 inches apart in the rows. The soil had been deeply dug but no manure was applied. The plants filled the space given them completely and flowered well in June. The species represented included *Papaver somniferum, P. Rhoeas, P. pavoninum, P. umbrosum,* and *P. glaucum.* One sent in as *P. laevigatum* proved to be *P. Rhoeas* only. The *P. somniferum* forms were the first to flower and the soonest over.

The Floral Committee examined the trial on two occasions, and made the following recommendations for awards :

Award of Merit.

21. Dwarf Scarlet Fringed, sent by Messrs. R. Veitch.
20. Scarlet King, sent by Messrs. Barr.

Highly Commended.

24. Cardinal Blush, sent by Messrs. Dobbie.
25. Cardinal Scarlet, sent by Messrs. Dobbie.
5. Dainty Lady, sent by Messrs. Barr.
7. Danebrog, sent by Messrs. Barr.
52. *Papaver pavoninum,* sent by Messrs. Barr.
13. Dwarf double Paeony-flowered mixed, sent by Messrs. Barr.
37, 38. New Double Queen, sent by Messrs. Barr, and R. Veitch.
50, 51. *Papaver umbrosum,* sent by Messrs. Dobbie and Barr.
4. The Admiral, sent by Messrs. Barr.
14. White Colossal, sent by Messrs. Barr.
15. White Swan (or Snowdrift) sent by Messrs. Barr.

Commended.

43. Picotee, sent by Messrs. Barr.

Of the forms to which awards were recommended in this trial *P. umbrosum* received **F.C.C.** when sent by Messrs. Benary in 1880. *P. somniferum* 'Cardinal White,' *P. glaucum,* and *P. Rhoeas* 'Shirley Poppies,' which had all received awards in past years, were represented, but the strains shown did not commend themselves to the Committee.

Varieties.*

1. The Bride (syn. Maid of the Mist).
2. Virginian Fringed.
3. Miss Sherwood.
4. The Admiral.
5. Dainty Lady.
6. Victoria Cross.
7. Danebrog.
8. King Edward.
9. Black Prince.
10. Charles Darwin.

* See footnote, p. 107.

11. Giant Carnation-flowered Double Mixed.
12. Giant Pæony-flowered Double Mixed.
13. Dwarf Double Pæony-flowered Mixed.
14. White Colossal.
15. White Swan (syn. Snowdrift).
16. Snowball.
17. Mikado.
18. Pæony-flowered Double Rose Brilliant.
19. Fireball.
20. Scarlet King.
21. Dwarf Scarlet Fringed.
22. The Cardinal.
23. Cardinal White.
24. Cardinal Blush.
25. Cardinal Scarlet.
26. Carnation-flowered.
27. Japanese Pompon.
28. Dwarf Pæony-flowered Snowball.
29. Cardinal Chamois.
30. Munstead Cream Pink.
31. Dwarf Rosy Pink.
32. No. 1 White Rose-edged.
33. Annual Shirley Poppies, Double.
34. The Shirley.
35. French Dwarf Double, or Ranunculus-flowered.
36. Hybrids Salmon and Orange, Stark's.
37. } New Double Queen.
38. }
39. Begonia-flowered.
40. Mixed Pompon, Rose and Salmon, Stark's.
41. Japanese Pompon, Mixed.
42. Shirley Picotee.
43. Picotee.
44. Rose and Pink Shades.
45. Shirley Poppy.
46. Raynes Park Hybrids.
47. }
48. } Shirley.
49. }
50. umbrosum.
51. umbrosum or Fire Dragon.
52. Peacock Poppy (*P. pavoninum*).
53. Scarlet Tulip.
54. Scarlet Tulip (*P. glaucum*).
55. Scarlet Tulip
56. Tulipa laevigatum (The Persian Poppy).

Papaver Somniferum Group.

A. Single.

(*a*) *White.*

1. The Bride (Maid of the Mist) (Barr).—Height, 3 feet; flower, 2½ to 3 inches, white; July 2.

(*b*) *White, margined pink.*

2. Virginian Fringed (Barr).—Failed.

3. Miss Sherwood (Barr).—Height, 2 feet 6 inches; flower, 3½ to 4 inches, light pink, with ivory white base; July 2.

(*c*) *Scarlet, white base.*

7. Danebrog (Barr), **XXX** July 5, 1917.—Height, 3 feet 6 inches; flowers, 4 inches, scarlet with white cross at base; July 2. Very like No. 4.

4. The Admiral (Barr), **XXX** July 5, 1917.—Height, 4 feet; flower, 4 inches, scarlet with white cross at base; July 28.

6. Victoria Cross (Barr).—Height, 3 feet 6 inches; flowers, 5 inches, light scarlet with white cross; July 26. A very mixed stock.

(*d*) *Scarlet, purple-black base.*

8. King Edward (Barr).—Height, 3 feet 6 inches; flower, 4 inches; scarlet, purple-black base; July 2. Mixed, some lurid purple with black base.

(*e*) *Light pinkish purple.*

5. Dainty Lady (Barr), **XXX** July 5, 1917.—Height, 3 feet; flower, 3 inches, light pinkish purple, with dark purple base held well above foliage; June 18.

(*f*) *Dark velvety purple, fringed.*

9. Black Prince (R. Veitch).—Height, 2 feet 9 inches; flower, 3 to 3½ inches, dark velvety purple, fringed, July 2.

(B) Single and Double.

10. Charles Darwin (Barr).—Height, 3 feet to 3 feet 6 inches; flower, 3½ inches, mostly dull red purple, dark purple-streaked blotch; June 21. Mixed with white and lighter colours.

11. Giant Carnation-flowered Double Mixed (Barr).—Height, 3 feet 6 inches flowers, 5 inches, fringed; June 26. Mixed, black purple with deep scarlet fringe, white with puce and scarlet fringe.

12. Giant Pæony-flowered Double Mixed (Barr).—Height, 3 feet 6 inches flowers, 4 to 5½ inches, mauve-white to deep carmine, some coarsely fringed; June 26.

C. Double.

(*a*) *White.*

23. Cardinal White (Dobbie).—Height, 2 feet 6 inches; flower, 3 to 4½ inches, some white, more or less fringed; June 28. Mixed single and double, some lemon and plain margins.

19. Fireball (Barr).—Height, 3 feet; flower, 3½ to 4½ inches; June 27. Good white, wrongly named, sent in as scarlet, pæony-flowered.

14. White Colossal (Barr), **XXX** July 5, 1917.—Height, 3 feet 6 inches; flower, 5 inches; June 21. Pæony-flowered, with three mauve rogues and one flesh-pink.

15. White Swan (syn. Snowdrift) (Barr), **XXX** July 5, 1917.—Height, 2 feet 6 inches to 3 feet; flower, 3 to 4 inches, fringed; July 2.

16. Snowball (Barr).—Failed.

28. Dwarf Pæony-flowered Snowball (R. Veitch).—Failed.

(*b*) *White, Red edges.*

17. Mikado (Barr).—Height, 2 feet; flower, 4 inches, white, red edges, fringed; July 10.

(*c*) *Flesh Pink.*

24. Cardinal Blush (Dobbie), **XXX** July 5, 1917.—Height, 18 inches; flower, 3½ inches, pink, yellowish base, fringed; July 2. Good dwarf stock.

31. Dwarf Rosy Pink (R. Veitch).—Height, 3 feet 6 inches; flower, 4 to 4½ inches, pink to scarlet, fringed; June 26. Very mixed, white and mauve-purple.

30. Munstead Cream Pink (Carter).—Height, 3 feet; flower 4½ to 5 inches, pink and flesh-pink, July 2. Pæony-flowered.

18. Pæony-flowered Double Rose Brilliant (Barr).—Height, 2 feet 6 inches; flower, 5 inches, flesh-pink, creamy centre; June 26. Mixed and variable.

(*d*) *Scarlet.*

25. Cardinal Scarlet (Dobbie), **XXX** July 5, 1917.—Height, 2 feet; flower, 3½ inches, fringed; July 2. Dwarf and true.

21. Dwarf Scarlet Fringed (R. Veitch), **A.M.** July 5, 1917.—Height, 2 feet 9 inches; flower, 4 to 5 inches, fringed; June 27.

20. Scarlet King (Barr), **A.M.** July 5, 1917.—Height, 3 feet 6 inches; flower, 4½ to 5 inches; July 2. Pæony-flowered.

22. The Cardinal (Barr).—Height, 2 feet 9 inches; flower, 4 to 5 inches, fringed; June 27. Not true; pink with white base rogue.

(*e*) *Chamois.*

29. Cardinal Chamois (Dobbie).—Height, 2 feet 6 inches; flower, 4 to inches, fringed; June 30. Mixed, lighter and darker in colour.

(*f*) *Mixed.*

26. Carnation-flowered (Sydenham).—Height, 3 feet; flower, 3½ to 4½ inches, fringed, from light pink, mauve-purple to scarlet; June 28.

13. Dwarf Double Pæony-flowered Mixed (Barr), **XXX** to strain, July 5, 1917.—Height, 2 feet 6 inches; flower, 5 inches, white, cerise, vermilion to scarlet; June 21. Dwarf habit, pæony-flowered.

Papaver Rhoeas Group.*

A. Single.

(a) White, Crimson margins.

43. Picotee (Barr), **XX** July 5, 1917.—Height, 2 feet 6 inches; flower, 4 inches; June 26. True stock.

(b) Mixed.

46. Raynes Park Hybrids (Carter).—Height, 2 feet 3 inches; flower, 3 to 4 inches, white to scarlet; June 21. Worth further selecting for smoky grey (blue) stock.
47. Shirley (R. Veitch).—Height, 2 feet 6 inches; flower, 3½ to 4 inches, white pinkish white, purplish cerise, vermilion with white margins; June 26.
48. Shirley (Dobbie).—Height, 2 feet 6 inches; flower, 3 to 4 inches, white, pink, blush, cerise, purple-mauve with crimson margin; June 20. True Shirley Poppy.
42. Shirley Picotee (R. Veitch).—Height, 2 feet; flower, 4 inches, picotee narrow and broad margins, some white; June 26. Dwarf.
45. Shirley (Barr).—Height, 2 feet 6 inches; flower, 3½ to 4 inches, pink with white margin, cerise, deep pink streaked darker, mauve with crimson margins; June 21. One rogue, scarlet with black blotch.
49. The Shirley (Sydenham).—Height, 2 feet 6 inches; flower, 3 to 4 inches, white to scarlet, some with white base and margin; June 26.

B. Semi-Double and Double.

(a) Cerise.

39. Begonia-flowered (Stark).—Height, 2 feet; flower, 3½ to 4 inches; June 26. Nice flower, good stock. Dwarf.

(b) Mixed.

34. The Shirley (Simpson).—Height, 2 feet 6 inches; flower, 4 inches, pinkish to scarlet, some with white base and margin; June 20. One rogue with black blotch.

(C) Single and Double.

35. French Dwarf Double or Ranunculus-flowered (Barr).—Height, 2 feet 6 inches; flower, 4½ inches, vermilion with white edges, deep scarlet, and deep shining scarlet with black blotch and white edges; June 21. Tall, not dwarf.
36. Hybrids Salmon and Orange (Stark).—Height, 2 feet to 2 feet 6 inches; flower, 3 to 4 inches; pinkish white, some suffused salmon, cerise, very light mauve, vermilion; June 18. Requires further selecting, contains rose.
37, 38. New Double Queen (Barr, R. Veitch), **XXX** July 5, 1917.—Height, 2 feet to 2 feet 6 inches; flower, 3½ to 4 inches, white, salmon, scarlet, some with scarlet and purple margins and lighter centres; June 18. Good flower, some frilled.
32. No. 1 White, rose-edged (Lansdell).—Height, 2 feet 3 inches; flower, 4 inches, deep scarlet, crimson with whitish base, deep pink whitish base; June 26. Very mixed, requires selecting.
27. Japanese Pompon (R. Veitch).—Height, 2 feet 3 inches; flower, 4 inches, scarlet with white margin, white with light purplish centre and margin, scarlet with mauvy margin; June 21. Pæony-flowered Shirley.
44. Rose and Pink Shades (Stark).—Height, 2 feet 3 inches; flower, 3 to 3½ inches, light flesh pink white margins, cerise, salmon, white flushed salmon; June 21.
33. Shirley Strain (Lansdell).—Height, 2 feet 3 inches; flower, 4 inches, white with light crimson edges, scarlet with white edges, white heavily suffused salmon; June 26. Many single.

* To this group belong the beautiful Shirley Poppies, selected with such care and distributed with such generosity by the Society's Secretary, Rev. W. Wilks. His strain received **F.C.C.** July 2, 1901.

Since they readily cross with the wild form they need constant roguing and isolation if they are to be kept true.

(D) Double.

40. Mixed Pompon Rose and Salmon (Stark).—Height, 2 feet; flower, 2½ to 3½ inches, cerise, light scarlet broad white margins, light salmon, pinkish white flush, some suffused deeper; June 21. Dwarf.

41. Japanese Pompon Mixed (Barr).—Height, 2 feet; flower, 2½ to 3 inches, all colours: July 7. A few single.

PAPAVER UMBROSUM (Fire Dragon Poppy).

50, 51. umbrosum (Dobbie, Barr), **XXX** July 5, 1917.—Height, 2 feet; flower, 2 inches, rich shining scarlet with black blotch (sometimes with grey margins); June 20. The grey should be selected out. In No. 51 the blotches were a little smaller.

PAPAVER PAVONINUM (The Peacock Poppy).

52. Peacock Poppy (Barr), **XXX** July 5, 1917.—Height, 2 feet to 2 feet 6 inches, habit rather straggling; flower, 2 to 2½ inches, orange-scarlet with black ring near base; June 12.

PAPAVER LAEVIGATUM (The Persian Poppy).

53, 54, 55, 56. Scarlet Tulip (Sydenham, Barr, R. Veitch, R. Veitch).—The smooth *P. laevigatum* was conspicuous by its absence, as there were only three or four plants of it in stocks, Nos. 53 and 54. No. 53 was very mixed, 54 and 55 were wrong, and 56 consisted of *P. Rhoeas* only.

SPRING-SOWN BEET AT WISLEY, 1917.

SEVENTY-THREE stocks of beet were sent in for spring-sowing in 1917. They were all sown on May 9 on ground which had carried late potatos in the previous year, after which mustard had been sown and dug in in early September. No manure had been applied to this plot since 1914. The drills were 18 inches apart, and the plants were thinned to 8 inches apart in the rows on June 12. All the stocks germinated well and made excellent growth. Mr. Wright, the Superintendent, and Mr. J. Wilson, Fruit Foreman, were responsible for the cultivation. The Fruit and Vegetable Committee judged the early varieties, Nos. 1 to 21, on July 27 and the remainder on September 28, and made the following recommendations for awards:

First-class Certificate.

No. 41. Green-top, Sutton's Strain (Sutton).

Award of Merit.

No. 45. Cheltenham Green-top (Sydenham).

38. Covent Garden Compact Top (Barr), which the Committee considered identical with Dewar's Northumberland Red.

57. Exhibition, Brydon's (Barr).

2. Globe, Sutton's Strain (Sutton).

36, 37. Northumberland Red, Dewar's (Barr, Nutting).

49. Perfection, Sutton's (Sutton).

53. Selected Red, Nutting's (Nutting).

3. Turnip-shaped, Dewing's (Barr).

Highly Commended (**XXX**).

No. 19. Egyptian, Crosby's (Barr).

67, 68, 69. Deep Blood-red Non-bleeding (McLennan, R. Veitch, Bell).

65. Black, Sutton's (Sutton).

66. Purple, Dobbie's (Dobbie).

The Committee considered Nos. 65 and 66 to be identical.

48. Market Favourite (Sutton).

9. Selected Globe (Dobbie).

29. Intermediate, Veitch's (Sutton).

73. Nonpareil Red, Yates' (Barr).

Commended (**XX**).

No. 11. Crimson Globe (Notcutt).

52. Exhibition, Pragnell's (Barr).

31. Perfection, Carter's (Carter).

23. Queen of the Blacks (Barr).

Of the foregoing, Cheltenham Green-top had received **A.M.** in 1896 when sent by Messrs. Watkins & Simpson, J. Veitch, Yates, and Nutting; Globe in 1908 when sent by Messrs. Sutton; and Nutting's Selected Red in 1908 when sent by Messrs. Barr, Carter, and J. Veitch.

One of the most marked differences in the varieties under trial was the relative size of the tops and of the space occupied by the plants. Several varieties with very large tops had roots no larger and no better in any way than others with small compact tops which would occupy less space in the garden. The Committee paid special attention to this point in recommending awards.

The question of the harm done by cutting or breaking the root or abrading the skin before cooking was raised by the variety sent in under the name of 'Deep Blood-red Non-bleeding Beet,' Nos. 67, 68, 69. Trial showed that though a certain amount of the red colour was lost from the root when it was cut into three or four pieces before boiling, yet its colour was still good afterwards, and it was also found that other well-coloured varieties might be cut before boiling with little detriment to the colour; whether the pieces were first put into cold or into boiling water made little difference. Such cutting led to some loss of sugar in the cooking and, therefore, to a slight reduction in the food value.

Two yellow-rooted varieties, No. 1, a round early one, and No. 70, a long one, were included in the trial and both would doubtless provide valuable food.

The great food value of garden beet seems little recognized, and at times like the present, when all food is valuable, they should be much more frequently used as vegetables than they are. The yield from a given area is very high, greater perhaps than that of any other vegetable when large roots are grown, and the food value per pound is also high.

VARIETIES.

*1. Early Golden Globe.
2. Sutton's Globe.
3. Turnip-shaped.
4. Lentz Red Turnip.
5. Early Model Globe.
6. Early Red Globe.
7. Early Red Globe.
8. Early Crimson Globe.
9. Selected Globe.
10. Model Globe.
11. Crimson Globe.
12. Crimson Ball.
13. Defiance Dark Red Turnip-rooted.
14. Blood-red Turnip-rooted.
15. Detroit.
16 Bassano.
17. Egyptian, Turnip-rooted.
18. Early Flat Egyptian.
19. Egyptian, Crosby's.
20. Early, Edmond's.
21. Columbia.
22. Strasburg Dark Red.
23. Queen of the Blacks.
24. Victoria.
25. Crimson Model Pear-shaped.
26., 27. Dainty.
28., 29. Intermediate, Veitch's.
30. Queen Mary.
31., 32. Perfection, Carter's.
33. Crapaudine.
34. Massy.
35. Crimson Gem.
36., 37. Northumberland Red.
38. Covent Garden Compact Top.
39. Intermediate, E. W. King's No. 1.
40. Intermediate, E. W. King's No. 2.
41. Green Top.
42. Favourite.
43. Cheltenham Green Leaf.
44. Cheltenham Green Top (selected).
45. Cheltenham Green Leaved.
46. Pine Apple.
47. Pine Apple.
48. Market Favourite.
49. Sutton's Perfection.
50. Non Plus Ultra.
51. St. Osyth.
52. Exhibition, Pragnell's.
53. Selected Red, Nutting's.

* See footnote p. 107.

54. Dwarf Red, Nutting's.
55. Improved Crimson.
56. Superb Red.
57. Exhibition, Brydon's.
58. Purple Top, Cattell's.
59. Blood Red.
60. Black, Goldie's.
61. Black Leaved, Dell's.
62. Crimson Leaved, Dell's.
63. Black, Whyte's.
64. Middleton Park Favourite.
65. Black, Sutton's.
66. Purple, Dobbie's.
67. }
68. } Deep Blood-red Non-bleeding.
69. }
70. Long Sweet Yellow.
71. Willow-leaved.
72. Obelisque Red.
73. Nonpareil Red.

DESCRIPTIONS.

I. YELLOW-FLESHED VARIETIES.

(a) Roots Round.

1. EARLY GOLDEN BALL (Barr).—Root 5 inches deep, 3 to 3½ inches diameter; globular, tapering; skin dull brown, smooth; flesh yellow with distinct orange zones and little core; growth rather spreading; leaves many, large, broad, smooth, light shining green, tinged yellowish. Stock even.

(b) Roots Long.

70. LONG SWEET YELLOW (Barr).—Root 14 inches long, 2½ to 3½ inches diameter; cylindrical; skin orange yellow, some reddish, more or less smooth; three-fourths root above soil; flesh yellow, zones fairly distinct, little core growth upright; leaves many, large, broad, shining, yellow-green. True stock, but roots rather irregular in shape.

II. RED-FLESHED VARIETIES.

(a) Roots Round.

1. Foliage more or less Green.

14. BLOOD-RED TURNIP-ROOTED (Barr).—Root 4 inches deep, 3 to 4 inches diameter; globular; skin dull red, slightly rough; flesh dark red, zones distinct, little core; growth upright; leaves many, large, broad, some crumpled, shining, dark green, much tinged purple. One bolted.

11. CRIMSON GLOBE (Notcutt), **XX** July 27, 1917.—Root 4 inches deep, 3 to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves fairly numerous, large, broad, smooth, some crumpled, shining, dark green, much tinged purple. One bolted.

13. DEFIANCE DARK RED TURNIP-ROOTED (Barr).—Root 3½ inches deep, 3 to 4 inches diameter; globular, tapering abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, large, broad, some crumpled, shining, dark green, tinged purple, some bronze.

15. DETROIT (Barr).—Plant 3½ inches deep, 2½ to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones distinct, sometimes white, core rather pronounced; growth upright; leaves many, large, broad, some crumpled, shining, dark green, tinged purple. Stock not true for root-shape.

3. DEWING'S TURNIP-SHAPED (Barr), **A.M.** July 27, 1917.—Root 5½ inches deep, 3 to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh brilliant, dark red, zones fairly distinct, little core; growth upright; leaves many, large, broad, smooth, shining, dark green, tinged purple.

8. EARLY CRIMSON GLOBE (Nutting).—See Early Red Globe.

5. EARLY MODEL GLOBE (Sydenham).—Root 4½ inches deep, 3 to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, sometimes distinctly zoned with white, little core; growth upright; leaves large and fairly numerous, broad, crumpled, shining, dark green, much tinged purple. Stock not true for length.

6. EARLY RED GLOBE IMPROVED (Barr).—See next.

6, 7, 8. EARLY RED GLOBE (Barr, R. Veitch, Nutting).—Root 4 inches deep, 3 to 4 inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth

upright; leaves many, large, broad, smooth, some crumpled, shining, dark green, some tinged purple. No. 6 was more bronze than 7 and 8. Nos. 7 and 8 were mixed, some inclined to half-long.

2. Globe (Sutton), **A.M.** 1908.—Root 4½ inches deep, 2½ to 3 inches diameter; globular, tapering abruptly; skin dull red, slightly rough; flesh brilliant dark red, zones fairly distinct, little core; growth upright; leaves rather few, of medium size, smooth, shining, dark green, much tinged purple.

4. Lentz Red Turnip (Barr).—Root 4 inches deep, 3 to 3½ inches diameter; globular, tapering; skin dull red, slightly rough; flesh red, more or less distinctly zoned with white, little core; leaves many, large, broad, rather spreading, smooth, shining, light green, little tinged purple. One bolted.

10. Model Globe (Simpson).—Root variable in size, 2½ to 3½ inches deep, 2½ to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, large, broad, crumpled, shining, dark green, much tinged purple some bronze.

9. Selected Globe (Dobbie), **XXX** July 27, 1917.—Root 4 inches deep, 3½ to 4 inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves of medium size and width, smooth, some crumpled, shining, dark green, much tinged purple.

2. Foliage Bronze.

12. Crimson Ball (Carter).—Root 2½ to 3 inches deep, 2½ to 3 inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, with distinct zones, sometimes distinctly zoned with white, little core; growth upright; leaves many, large, broad, crumpled, shining, bronze.

(b) Roots Flat Round.

16. Bassano (Barr).—Root 3 inches deep, 3½ to 4 inches diameter; skin deep red, fairly smooth; flesh red, zones distinct, some white, little core; growth rather spreading; leaves medium to large, broad, shining, yellow-green, little tinged purple.

21. Columbia (Barr).—A mixed stock.

19. Crosby's Egyptian (Barr), **XXX** July 27, 1917.—Root 2 inches deep, 3½ to 4 inches diameter; skin deep red, fairly smooth; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, medium to large, shining, dark green, more or less tinged purple.

18. Early Flat Egyptian (Barr).—Root 3 inches deep, 3 to 4 inches diameter; flat round, some tapering; skin deep red, fairly smooth; flesh dark red, zones distinct, some white; growth upright; leaves fairly numerous, medium to large, broad, some crumpled, shining, dark green, some much tinged purple. Variable in size, some bronze, some globular.

20. Edmond's Early (Barr).—Root 4 inches deep, 3½ to 2½ inches diameter; flat round, some tapering; skin deep red, fairly smooth; buried beneath soil; flesh dark red, variable, zones variable, little core; growth upright; leaves fairly numerous, medium to large, broad, some narrower, some crumpled, shining, dark green, tinged and much tinged purple. Mixed, some flat, some conical.

17. Egyptian Turnip-rooted (Sutton).—Root 2 inches deep, 3½ to 4½ inches diameter; skin deep red, fairly smooth; growth upright; leaves fairly numerous, of medium size, fairly broad, some crumpled, shining, dark green, more or less tinged purple.

(c) Roots Intermediate.

1. Foliage Green.

28. Intermediate, Veitch's (R. Veitch).—Root 7½ inches deep, 2 to 3½ inches diameter; skin dull deep red, fairly smooth; three-fourths root above soil; flesh dark red, zones distinct, little core; growth upright; leaves many, rather small, of medium width, slightly crumpled, shining, dark green, more or less tinged purple. A mixed stock with many misshapen roots.

29. Intermediate, Veitch's (Sutton), **XXX** September 28, 1917.—Root 6½ inches deep, 2 to 3½ inches diameter; skin dull deep red, fairly smooth; two-thirds root above soil; flesh dark, more brick-red than No. 28, zones distincto little core; growth upright; leaves small to medium size and breadth, shining, dark green, tinged purple, some bronze.

39, 40. INTERMEDIATE, KING'S, NOS. 1 and 2 (E. W. King).—Root 7 inches deep, 3 to 4 inches diameter; skin dull dark red, smooth; half-root above soil; flesh dark red, zones distinct, some white, little core; growth upright; leaves many, of small to medium size and width, crumpled, shining, dark green, much tinged purple. Variable in leaf colour, some bronze, roots rather coarse and not of one shape.

73. NONPAREIL RED, YATES' (Barr), **XXX** September 28, 1917.—Root 8 to 10 inches deep, 3½ to 4 inches diameter; oblong with abrupt tap root; skin deep red, smooth, rough at top; half root above soil; flesh deep red, z nes distinct, rather large core; growth upright; leaves medium to large, fairly broad, crumpled, shining, dark green, much tinged purple.

72. OBELISQUE RED, YATES' (Barr).—Root 8 to 10 inches deep, 3½ to 4 inches diameter; oblong with abrupt tap root; skin deep red, smooth, rough; half root above soil; flesh deep red, zones distinct, variable, some showing white, rather large core; growth upright; leaves many, medium to large, fairly broad, shining, dark green, much tinged purple.

30. QUEEN MARY (Harrison).—Root 7 inches deep, 2½ to 3½ inches diameter; skin dull deep red, fairly smooth; three-fourths root above soil; flesh dark red, zones distinct, little core; growth upright; leaves many, of small to medium size and width, shining, dark green, tinged purple, some bronze.

2. Foliage Bronze.

25. CRIMSON MODEL PEAR-SHAPED (R. Veitch).—Root 5 to 6 inches deep, 3 to 4 inches diameter; tapering; skin dull deep red, smooth; one-fourth root above the soil; flesh dark red, zones distinct, some white, rather large core; growth upright; leaves many, large, broad, crumpled, shining, bronze, some greenish.

26, 27. DAINTY (Carter, Barr).—Root 7 inches deep, 3 to 4 inches diameter; tapering; skin dull deep red, smooth; one-fifth root above the soil; some buried; flesh dark red, zones indistinct, little core; growth upright; leaves many, fairly large, of medium width, crumpled, shining, bronze, some green. Stocks not true, and some more top than root. In No. 26 one, and 27 two, bolted.

23. QUEEN OF THE BLACKS (Barr), **XX** September 28, 1917.—Root 5 inches deep, 3 to 4 inches diameter; tapering; skin dull deep red, fairly smooth; one-third root above the soil; flesh variable, dark red, zones distinct, little core; growth upright; leaves many, large, broad, crumpled, shining, bronze.

22. STRASBURG DARK RED (Barr).—Root 6½ inches deep, 3 to 3½ inches diameter; tapering; skin dull deep red, fairly smooth, slightly russeted at top; half root above the soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, large, broad, crumpled, shining, bronze and some green. Irregular stock, some long.

(*c*) *Roots Long.*

(1) Foliage more or less Green.

67, 68, 69. BELL'S DEEP BLOOD-RED NON-BLEEDING (McLennan, R. Veitch, Bell), **XXX** September 28, 1917.—Root 12 inches long, 2½ to 3 inches diameter; tapering into rather abrupt tap root; skin dark dull red, fairly smooth; one-fifth root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, large, broad, little crumpled, shining, dark green, tinged more or less with purple. Raised and introduced by Messrs. Bell.

65. BLACK (Sutton), **XXX** September 28, 1917.—Root 9 inches long, 2½ to 3 inches diameter; tapering, sometimes abruptly; skin dark dull red, fairly smooth; two-sevenths root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, large, broad, crumpled, shining, dark green, much tinged purple. True stock.

60. BLACK, GOLDIE'S (Barr).—Root 10 inches long, 3 to 4 inches diameter; tapering rather abruptly; skin dark dull red, fairly smooth, rough at top; one-fourth root above soil; flesh very dark red, zones distinct, variable, core variable; growth upright; leaves many, large, broad, crumpled, some plane, shining, variable in colour, mainly dark green, much tinged purple. Good colour, but coarse in texture and side roots rather numerous.

63. BLACK, WHYTE'S (Barr).—Root 10 inches long, 3½ to 4 inches diameter; tapering; skin dark dull red, smooth; one-eighth root above soil; flesh dark red, rather coarse, zones indistinct, little core; growth rather spreading; leaves many, large, broad, shining, dark green, tinged more or less with purple. Mixed, some larger and more crumpled.

43, 44, 45. CHELTENHAM GREEN TOP (Harrison, Barr, Sydenham), No. 45, **A.M.** September 28, 1917.—Root 9 inches long, 2½ to 4 inches diameter; tapering; skin dark red, smooth; one-seventh root above soil; flesh dark red, zones indistinct, little core; growth rather spreading; leaves fairly numerous, of medium size and width, plain, shining, green, slightly tinged purple. Nos. 43 and 44 were good, but with rather larger foliage and the zones were more distinct.

38. COVENT GARDEN COMPACT TOP.—See Dewar's Northumberland Red.

33. CRAPAUDINE (Barr).—Root 6 inches deep, 2 to 2½ inches diameter; tapering; skin russeted red, rough; flesh very dark red, zones indistinct, little core; growth rather spreading; leaves many, of medium size and width, shining, green, slightly tinged purple. Many rough side roots, small top, distinct, splendid colour, but small.

62. DELL'S CRIMSON-LEAVED (Barr).—Root 9 to 13 inches long, 3 to 4 inches diameter; tapering into rather abrupt tap root; skin dark red, smooth; one-fourth root above soil; flesh dark red, zones indistinct but variable, little core; growth upright; leaves medium to large, medium to broad in width, some crumpled, shining, dark green, much tinged purple, some bronze.

36, 37, 38. DEWAR'S NORTHUMBERLAND RED (Nutting, Barr, Barr), **A.M.** September 28, 1917.—Root 10 inches deep, 2½ to 3 inches diameter; tapering; skin dark red, smooth; one-fourth root above soil; flesh dark red, zones distinct, some white, little core; growth rather spreading; leaves many, of medium size and width, little crumpled, shining, dark green, much tinged purple, some bronze. No. 38 was sent in as 'Covent Garden Compact-top,' but the Committee considered it identical with Nos. 36 and 37.

54. DWARF RED, NUTTING'S (Barr).—Root 10 inches long, 3 to 4 inches diameter; tapering; skin dull dark red, rather rough, rather large core; one-fourth root above soil, some buried; flesh dark red, zones distinct white circles, core rather large; growth upright; leaves large, broad, crumpled, shining, dark green, much tinged purple, some bronze.

57. EXHIBITION, BRYDON'S (Barr), **A.M.** September 28, 1917.—Root 10 inches long, 3 inches diameter; tapering; skin very dark dull red, smooth; three-sevenths root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, medium to large, of medium width, little crumpled, shining, green, tinged more or less with purple.

42. FAVOURITE (Simpson).—Root 9 inches long, 3 to 3½ inches diameter; tapering; skin dull dark red, rather rough; half root above soil; flesh very dark red, zones indistinct, little core; growth spreading; leaves many, small to medium, medium to broad in width, shining, green, tinged purple.

41. GREEN TOP (Sutton), **F.C.C.** September 28, 1917.—Root 8 inches long, 2½ to 3 inches diameter; tapering; skin dull dark red, smooth; one-sixth root above soil; flesh very dark red, zones indistinct, little core; growth spreading; leaves many, of medium size and width, plain, shining, green, little tinged purple.

48. MARKET FAVOURITE (Sutton), **XXX** September 28, 1917.—Root 10 inches long, 2½ to 3 inches diameter; tapering; skin dark red, smooth; one-eighth root above soil; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, of medium size, fairly broad, nearly plane, shining, dark green, much tinged, purple, some almost bronze.

34. MASSY (Barr).—Root 9 inches deep, 2½ to 3 inches diameter; tapering; skin dull dark red, smooth; one-seventh root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves of medium to large size and width, dark green, crumpled, and tinged purple. A rather coarse variety.

64. MIDDLETON PARK FAVOURITE (Barr).—Root 9 inches long, 3 to 3½ inches diameter; tapering; skin dark red, smooth; two-sevenths above soil; flesh dark red, zones distinctly variable, little core; growth upright; leaves many, large, broad, shining, dark green, much tinged purple and bronze. Mixed.

52. PRAGNELL'S EXHIBITION (Barr), **XX** September 28, 1917.—Root 6 inches long, 2 to 2½ inches diameter; tapering; skin dark red, smooth; flesh dark red, zones distinct, with white circles, little core; root mostly buried; growth fairly upright; leaves many, small to medium, of medium width, slightly crumpled, shining, dark green, much tinged purple. Good stock.

66. PURPLE (Dobbie), **XXX** September 28, 1917.—Identical with No. 65 Black.

58. PURPLE TOP, CATTELL'S (Barr).—Root 10 inches long, 3 to 3½ inches diameter; tapering; skin very dark dull red, smooth; one-fourth root above soil; flesh dark red, zones distinct, core rather large; growth upright, vigorous; leaves many, large, broad, crumpled, shining, green, much tinged purple, bronze and green. Mixed, irregular.

53. SELECTED RED (Nutting), **A.M.** September 28, 1917.—Root 6 inches long, 2 to 2½ inches diameter; tapering; skin dark red, smooth; root mostly buried; flesh dark red, close-grained, zones indistinct, little core; growth fairly upright; leaves many, small to medium, of medium width crumpled, slightly shining, dark green, much tinged purple.

56. SUPERB RED (R. Veitch).—Root 10 inches long, 2½ to 3 inches diameter; tapering; skin very dark dull red, fairly smooth; one-eighth root above soil; flesh very dark red, rather coarse, zones indistinct, little core; growth upright; leaves many, medium to large, fairly broad, crumpled, shining, dark green, much tinged purple.

2. Foliage Bronze.

59. BLOOD RED (Sutton).—Root 10 inches long, 1½ to 2 inches diameter; tapering; skin dark red, smooth; one-ninth root above soil; flesh dark red, zones distinct, little core; growth upright to spreading; leaves many, of medium size and width, slightly crumpled, shining, bronze.

35. CRIMSON GEM (Barr).—Root 9 inches long, 2½ to 3 inches diameter; tapering; skin dark red, smooth; one-seventh root above the soil; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, medium size, and medium to broad in width, crumpled, shining, bronze.

61. DELL'S BLACK-LEAVED (Nutting).—Root 8 inches long, 1½ to 2 inches diameter; tapering; skin dark red, smooth, little russeted at top; one-third root above soil; flesh dark red, zones distinct, little core; growth upright; leaves many, of medium size and width, plain, shining, bronze.

55. IMPROVED CRIMSON (Notcutt).—Root 7 inches long, 1½ to 3 inches diameter; tapering; skin dark red, smooth; one-fifth root above soil, some buried; flesh dark red, zones indistinct, some distinct, little core; growth fairly upright; leaves many, small, rather narrow, plain, shining, bronze.

50. NON PLUS ULTRA (Barr).—Root 8 inches long, 3 to 3½ inches diameter; tapering; skin dull dark red, fairly smooth, mostly buried; flesh very dark red, zones variable, some distinct, some not, little core; growth upright; leaves many, large, broad, some crumpled, shining, bronze and green. Mixed and many side roots. One bolted.

31, 32. PERFECTION (Carter, Barr), No. 31, **XX** September 28, 1917.—Root 9 inches deep, 2 to 3½ inches diameter; tapering; skin dull deep red, fairly smooth, mostly buried; flesh very dark, zones indistinct, little core; growth upright, leaves many, of medium size and width, crumpled, shining, bronze. No. 32 was not as dark in colour, and had one-third root out of soil.

49. PERFECTION (Sutton), **A.M.** September 28, 1917.—Root 9 inches long, 2 to 2½ inches diameter; tapering; skin dark red, smooth; one-eighth root above soil; flesh very dark red, zones indistinct, little core; growth rather spreading; leaves rather few, small, rather narrow, slightly crumpled, shining, bronze.

46. PINE APPLE (Sutton).—Root 9 inches long, 2½ to 3 inches diameter; tapering; skin dark red, smooth; two-sevenths root above soil; flesh dark red, zones distinct, little core; growth rather spreading; leaves fairly numerous, small to medium, of medium width, crumpled, shining, bronze.

47. PINE APPLE (Barr).—Root 9 inches long, 2 to 3½ inches diameter; tapering; skin dull dark red, fairly smooth; one-fourth root above ground, some buried; flesh dark red, zones fairly distinct, little core; growth upright; leaves large, broad, crumpled, shining, bronze.

51. ST. OSYTH (Barr).—Root 10 inches long, 2 to 3½ inches diameter tapering; skin dark red, smooth; one-fourth root above soil, variable, some more; flesh dark red, zones distinct, little core; growth spreading; leaves many, small to medium, of medium width, some crumpled, shining, bronze and green, tinged purple. Mixed, some upright and more vigorous, some green.

24. VICTORIA (Barr).—Root 7 inches deep, 1½ inches diameter; tapering; skin dull deep red, fairly smooth; one-fifth root above the soil; flesh dark red, zones indistinct, little core; growth upright; leaves not very numerous, small, narrow, nearly plain, shining, bronze.

71. WILLOW-LEAVED (Dobbie).—Root 7 inches long, 2 inches diameter; tapering; skin dark red, smooth, little russeted at top; root mostly buried; flesh dark red, zones indistinct, little core; growth upright; leaves many, small, narrow, wavy, shining, bronze. A true stock of good colour for garden decoration.

SUMMER-SOWN BEET AT WISLEY, 1917–18.

EIGHTY-ONE stocks of beet were sown at Wisley on July 11, 1917, to determine the varieties most suitable for late sowing. They included all types of root, but only the turnip-shaped beets came to sufficient size to make this method of growing beets worth while. Many of these, however, were of a size suitable for use from Christmas onwards, the best being Nos. 1, 2, 3, 5, 6, 7, 8, 10, 11, 16, 17, 18, 21, 24, 31, 33, 78. It seems little known that, at least on well drained soils in the south of England, round beets sown by mid-July will reach a size suitable for cooking and may be left out unprotected through the whole winter, remaining useful until May. It is unsafe to leave the spring-sown beets on the ground, but so long as the summer-sown plants have not reached such a size that the crown begins to fork, they suffer little or no damage, even in severe weather.

VARIETIES.

*1. Crimson Ball.
2. Early Model Crimson Globe.
3. Crimson Globe (Kelway).
4. Crimson Globe (Webb).
5. Crimson Globe, Sutton's (Kelway).
6. Crimson Globe (Cooper-Taber).
7. Crimson Globe (Nutting).
8. Excelsior Turnip-rooted.
9. Reliance Globe.
10. Witham Fireball.
11. Crosby's Egyptian Beet.
12. The Crosby.
13. Egyptian Turnip-rooted.
14. Egyptian Turnip-rooted Selected.
15. Egyptian Turnip-rooted.
16. Arlington Globe.
17. Defiance Dark Red Turnip-rooted.
18. Defiance.
19. Prizetaker.
20. Model or Improved Globe.
21., 22. Detroit.
23. Early Model Globe.
24. Early Model Red Globe.
25. Eclipse.
26. Early Red Globe.
27. Globe (Dobbie.
28. Globe (Sutton).
29., 30. Middleton Park.
31., 32. Dell's Black.
33. Superb Red.
34. Pear-shaped.
35. Crimson (Nutting's).
36. Purple.
37. Queen of the Blacks.
38., 39. Intermediate No. 1.
40. Intermediate No. 2.
41. New Intermediate.
42. Intermediate.
43., 44., 45. Cheltenham Green Top Selected.
46. Purple.
47., 48. Perfection.
49. Whyte's Black.
50. Market Favourite.
51. Pine Apple.
52. Henderson's Pineapple.
53. Dwarf Red.
54. Nutting's Dwarf Red.
55., 56., 57. Brydon's Exhibition.
58. Dewar's Northumberland Red.
59. Dewar's Northumberland Red Selected.
60., 61. Pragnell's Exhibition re-selected.
62. Covent Garden Compact Top.
63. Crimson King.
64. Dainty.
65. St. Osyth.
66. Black King.
67. Elcombe's Victoria.
68. Purple.
69. Goldie's Superb Black.
70. Dell's Crimson extra select.
71. Blood Red.
72. No. 100 Non-bleeding Deep Blood Red.

* See p. 107.

73. Scarlet Perfection.
74. Spinach Beet.
75. Perpetual Spinach.
76. Seakale Beet.
77. Sugar Beet.
78. Crimson Ball.
79. Egyptian Turnip-rooted.
80. Round.
81. Bassano.

As the longer rooted types of beet proved unsuitable for this system o growing, no further mention of them is made in the following notes.

DESCRIPTIONS.

Red-Fleshed Varieties.

(a) *Roots round.*

(1) Foliage more or less Green.

78. Crimson Ball (Carter).—See p. 491. Stood well, but had three with green foliage.

22. Detroit Early Round (Cooper-Taber).—See p. 490. Mixed, green, tinged, and bronze foliage. Root very good deep colour.

24. Early Model Red Globe (R. Veitch).—See p. 490. Stood well, but mixed, green, tinged and bronze foliage.

25. Eclipse (Kelway).—Root 3 inches deep, 2 to 3 inches diameter; skin dark red, smooth; one-half root above soil; flesh dark red, zones variable, little core; growth upright to spreading; leaves many, large, wide, plain and crumpled, green, tinged and bronze.

(2) Foliage Bronze.

23. Early Model Globe (Sydenham).—See p. 490.

26. Early Red Globe (Barr).—See p. 490. The stock had two green-foliage plants.

27. Globe (Dobbie).—See p. 491.

28. Globe (Sutton).—See p. 491. The stock had one green-foliage plant.

80. Round (Carter).—Root 1½ inches deep, 1 to 1¼ inches diameter; skin dull dark red, rather rough; buried beneath soil; flesh very dark red, zones indistinct, little core; growth upright; leaves fairly numerous, of narrow to medium width, crumpled, very dark bronze.

(b) *Roots flat-round.*

(1) Foliage more or less Green.

16. Arlington Globe (Cooper-Taber).—Root 2 inches deep, 2 to 2½ inches diameter; skin dull dark red, smooth; one-third root above soil; flesh dark red, zones indistinct, little core; growth spreading; leaves many, large, wide, crumpled (some plain), much tinged and bronze. Stood well. Mixed, green, tinged, and bronze foliage.

81. Bassano (Carter).—See p. 491. Rather poor plant, roots with many side shoots.

1. Crimson Ball (Barr).—See p. 491. Stood well, but had four green-foliage plants.

3. Crimson Globe (Barr).—Root 2½ inches deep, 2½ to 3 inches diameter; skin dull dark red, smooth; one-third root above soil (some buried); flesh dark red, zones variable, little core; growth upright to spreading; leaves many, large, wide, crumpled, much tinged and bronze. Stood well, but eight green-foliage plants.

4. Crimson Globe (Webb).—Root 2½ inches deep, 2½ inches diameter; skin dull dark red, smooth; one-third root above soil (some buried); flesh dark red, zones indistinct, little core; leaves of medium to large size, fairly broad, crumpled, much tinged and bronze. Rather poor plant, and six plants with green foliage.

5. Crimson Globe (Kelway).—Stood well, but had five green-foliage plants.

21. Detroit (Kelway).—See p. 490. Stood well. Mixed, green, tinged, and bronze foliage.

2. Early Model Crimson Globe (Kelway), **XXX** February 19, 1918.—Root 2 inches deep, 2 to 2½ inches diameter; skin dull dark red, smooth; one-third root above soil; flesh very dark red, zones indistinct, core little; growth

upright; leaves of medium to large size, fairly wide, crumpled, much tinged and bronze. Stood well, root rather poor in size but very good colour.

8. Excelsior Turnip-rooted (Barr).—Root 2 inches deep, 2 inches diameter; skin dull dark red, smooth; about one-third root above soil (some buried); flesh dark red, zones distinct, little core; growth upright to spreading; leaves many, large, broad, crumpled, much tinged, and bronze. Stood well, but with four greenish foliage plants.

19. Prizetaker (Dawkins).—Root $2\frac{1}{2}$ inches deep, 2 inches diameter; skin dull dark red, smooth; about one-third root above soil (some buried); flesh dark red, zones mostly indistinct, little core; growth upright, leaves fairly numerous, of medium size, fairly broad, crumpled, tinged and bronze. Rather poor plant, some with greenish foliage.

9. Reliance Globe (Webb).—Root 2 inches deep, $2\frac{1}{2}$ inches diameter; skin dull dark red, smooth; about one-third root above soil; flesh red, some with white rings, zones distinct, little core; growth rather spreading; leaves of medium size and width, crumpled, much tinged, and bronze. Rather poor plant, with eight green-foliage plants.

10. Witham Fireball (Cooper-Taber).—Root 3 inches deep, 2 to $2\frac{1}{2}$ inches diameter; skin dull dark red, smooth; one-fourth root above soil; flesh dark red and deep brick-red, zones indistinct, but variable, little core; growth upright; leaves many, large, wide, crumpled, much tinged, and bronze. Stood well, but with four green-foliage plants.

(2) Foliage bronze.

6. Crimson Globe (Cooper-Taber).—Similar to No. 7.

7. Crimson Globe (Nutting).—See p. 490. Stood well, but had three green-foliage plants. A very good stock.

11. Crosby's Egyptian (Barr).—See p. 491. Stood well, but had six green and some greenish foliage plants.

17. Defiance Dark Red Turnip-rooted (Barr).—See p. 490. Stood well.

18. Defiance (Hurst).—Similar to No. 17. A very good stock.

13. Egyptian Turnip-rooted (Sutton).—See p. 491. Three plants with greenish foliage.

14. Egyptian Turnip-rooted Selected (Barr).—See p. 491. Three plants with greenish foliage.

15. Egyptian Turnip-rooted (Webb).—Like 14. Rather irregular and also variable in colour.

79. Egyptian Turnip-rooted (Carter).—Root $1\frac{1}{2}$ inches deep, 2 inches diameter skin dull dark red, fairly smooth one-third root above soil; flesh dark red, some showing white, zones variable, little core; growth upright; leaves many, of medium size and width, slightly crumpled, bronze. Some green much tinged foliage plants.

20. Model or Improved Globe (Dawkins).—Root $1\frac{1}{2}$ to 2 inches deep, $1\frac{1}{2}$ inches diameter; skin dull dark red; smooth; root mostly beneath soil; flesh dark red, zones mostly indistinct, little core; growth upright; leaves rather few, of small to medium size and width, crumpled, bronze. Rather poor plant.

12. The Crosby (Cooper-Taber).—Like No. 11.

[Note.—Comparison of the arrangement here and on pp. 490 and 491 suggests that the amount of bronzing of foliage is to some extent dependent upon the season, and the shape of the root upon its maturity.]

MID-SEASON PEAS TRIED AT WISLEY, 1916.

ONE hundred and twenty-one stocks of Peas were grown for trial on ground that was trenched in the autumn of 1914, and dug and lightly manured in the autumn of 1915. The seeds were sown on March 31, 1916, at distances between the rows varying according to height, from 4 to 6 feet. Germination was generally excellent, and the growth first class. The Pea Weevil attacked the plants when just through the soil, but one spraying with lead arsenate checked that pest.

The rainfall was ·98 April, 1·76 May, 1·55 June, ·80 July.

The cultivation was under the charge of the Superintendent and the fruit and vegetable foreman, Mr. J. Wilson.

The trial was judged on July 17 for first mid-season, and on August 8 for the second mid-season varieties, and the following were selected as the best in their respective seasons.

FIRST MID-SEASON.

Award of Merit.

116. Clipper, sent by Messrs. Sydenham.
17. Danby Stratagem, sent by Messrs. Carter.
97. Duke of Albany, sent by Messrs. Sutton.
98. Duke of Albany, re-selected, sent by Messrs. Carter.
7. Evergreen Delicatesse, sent by Messrs. Carter.
86. Harvestman, sent by Messrs. Carter.
65. Improved Queen, sent by Messrs. Carter.
85. International, sent by Messrs. Carter.
51. Jersey Hero, sent by Messrs. Nutting.
54. Magnum Bonum, sent by Messrs. Barr.
87. Market Gardener, sent by Messrs. Carter.
109. Prince of Peas, sent by Messrs. Sutton.
112, 113. Quite Content, sent by Messrs. Barr and Messrs. Carter.
47. Royal Salute, sent by Messrs. Dickson.
106. Market King, sent by Messrs Carter.
90. Standard, sent by Messrs. Barr.
9. The Newby, sent by Messrs. Hurst.

Highly Commended.

35. Best of All, sent by Messrs. Sydenham.
5. Buttercup, sent by Messrs. Carter.
2. Daisy, sent by Messrs. Simpson.
42. Gradus, sent by Messrs. Simpson.
94. Model Telephone, sent by Messrs Carter.
64. Red Cross, sent by Mr. Sim.

15. Stratagem, sent by Messrs. Carter.
110. Centenary, sent by Messrs. Sutton.
11. Favourite, sent by Messrs. Sutton.
27. Peerless, sent by Messrs. Sutton.
88. Reliance Marrowfat, sent by Messrs. Webb.

Commended.

114. King George, sent by Messrs. Webb.

SECOND MID-SEASON.

Award of Merit.

66. Glory of Devon, sent by Messrs. Barr.
56. Continuity, sent by Messrs. Sutton.
55. Masterpiece, sent by Messrs. Sutton.
63. Matchless, sent by Messrs. Sutton.
52. Perpetual, sent by Messrs. Sutton.
41. Satisfaction, sent by Messrs. Sutton.

Highly Commended.

18. The Victor, sent by Messrs. Johnson.

Commended.

96. Alderman, sent by Messrs. Simpson.
12. Commonwealth, sent by Messrs. Carter.
40. Magnificent, sent by Messrs. Barr.
119. Ne Plus Ultra, sent by Messrs. Sydenham.
48. Paragon, sent by Messrs. Dickson & Robinson.
57. Best of All, sent by Messrs. Sutton.
21. Discovery, sent by Messrs. Sutton.
61. Incomparable, sent by Messrs. Sutton.
20. Prizewinner, sent by Messrs. Sutton.
111. Up-to-Date, sent by Messrs. Sutton.
108. The 'V.C.,' sent by Messrs. Sutton.
83. William Richardson, sent by Messrs. Nutting.

Stocks under the same name as those recorded above have had awards in previous trials as follows :—

17. Danby Stratagem (**A.M.** 1901, Carter) ; 7. Evergreen Delicatesse **A.M.** 1908, Carter) ; 86. Harvestman (**A.M.** 1908, Carter) ; 85. International (**A.M.** 1908, Carter) ; 54. Magnum Bonum (**A.M.** 1910, Barr) ; 109. Prince of Peas (**A.M.** 1910, Sutton) ; 112, 113. Quite Content (**F.C.C.** 1906, Beckett) ; 90. Standard (**A.M.** 1900, Sharpe) ; 2. Daisy (**F.C.C.** 1902, Wythes) ; 42. Gradus (**F.C.C.** 1900, Laxton) ; 15. Stratagem (**F.C.C.** 1882, Carter) ; 11. Favourite (**A.M.** 1913, Sutton) ; 27. Peerless (**F.C.C.** 1903, Barr) ; 66. Glory of Devon (**A.M.** 1899, R. Veitch) ; 56. Continuity (**A.M.** 1898, Sutton) ; 55. Masterpiece (**A.M.** 1913, Sutton) ; 41. Satisfaction (**A.M.** 1910, Sutton) ; 96. Alderman (**F.C.C.** 1900, Deal) ; 40. Magnificent (**F.C.C.** 1884, Eckford) ; 20. Prizewinner (**F.C.C.** 1901, Sutton).

The following varieties which had gained awards in earlier trials were grown but were not regarded as equal in merit to those in the foregoing list :—

Centenary (**A.M.** July 5, 1901 (Sutton)); Dawn (**A.M.** July 30, 1908 (Carter)); Dr. McLean (**A.M.** July 18, 1902 (Sutton)); Duke of York (**A.M.** June 6, 1893 (Cooper-Taber)); Edwin Beckett (**F.C.C.** July 3, 1900 (Beckett)); Eureka (**A.M.** July 18, 1911 (Sutton)); Exhibition (**A.M.** August 16, 1910 (Carter)); G. F. Wilson (**F.C.C.** 1872 (Carter)); King Edward (**A.M.** July 18, 1911 (Sutton)); Majestic (**A.M.** July 14, 1897 (Watkins & Simpson)); Moneymaker (**A.M.** August 2, 1910 (J. K. King)); Perfection (**A.M.** July 14, 1897 (R. Veitch)); Premier (**A.M.** July 18, 1911 (Bell)); Pride of the Market (**F.C.C.** July 22, 1881 (Carter)); Prior (**A.M.** July 22, 1898 (Eckford)); Prolific Marrowfat (**A.M.** July 18, 1902 (J. Veitch)); Queen (**A.M.** July 5, 1901 (Sharpe)); Saccharine (**A.M.** July 26, 1898 (Sim)); Scotsman (**A.M.** August 15, 1905 (Bell)); Senator (**F.C.C.** July 11, 1902 (A. Dean)); The Sherwood (**A.M.** July 5, 1901 (Hurst, Sutton)); Unique (**F.C.C.** 1872 (Laxton)); Warriston Wonder (**A.M.** July 15, 1913 (Bell)); Yorkshire Hero (**A.M.** August 16, 1910 (Sutton)).

VARIETIES.

*1., 2. Daisy.
3. The Sherwood.
4. Pride of the Market.
5. Buttercup.
6. Blue Beauty.
7. Evergreen Delicatesse.
8. Warwickshire Pride.
9. The Newby.
10. Nonsuch.
11. Favourite.
12. Commonwealth.
13. Unique.
14. Abundance.
15., 16. Stratagem.
17. Danby Stratagem.
18. The Victor.
19. Majestic.
20. Prizewinner.
21., 22. Discovery.
23. King Edward.
24. Invincible.
25. Dr. McLean.
26., 27. Peerless.
28. Senator.
29. G. F. Wilson.
30. Plentiful.
31. Territorial.
32., 33. Veitch's Perfection.
34., 35. Eureka.
36., 37. Prince of Wales.
38., 39. Sharpe's Queen.
40. Magnificent.
41. Satisfaction.
42. Gradus.
43. Yorkshire Hero.
44. Prizewinner.
45. Hurst's Second Early Round.
46. Delicatesse.
47. Royal Salute.
48. Paragon.
49. Perfection.
50. Prolific Marrow.
51. Jersey Hero.
52. Perpetual.
53., 54. Magnum Bonum.
55. Masterpiece.
56. Continuity.
57., 58. Best of All.
59., 60. Superlative.
61. Incomparable.
62. Supremacy.
63. Matchless.
64. Red Cross.
65. Improved Queen.
66., 67., 68. Glory of Devon.
69. Sensation.
70. Queen Mary.
71. Seedling 230.
72. Bell's Premier.
73. Edwin Beckett.
74. Lancastrian.
75. Gladstone.
76. Scotsman.
77. Seedling 231.
78. Victorious.
79. Constellation.
80. Dawn.
81. Essex Wonder.
82., 83. William Richardson.
84. Exhibition.
85. International.
86. Harvestman.
87. Market Gardener.
88. Reliance Marrowfat.
89. Nonsuch Marrowfat.
90. Sharpe's Standard.

* See footnote, p. 107.

91. Union Jack.
92. Thousandfold.
93. Saccharine.
94. Model Telephone.
95., 96. Alderman.
97., 98. Duke of Albany.
99. Prior.
100. Battleship.
101. Duke of York.
102. General Joffre.
03. Telegraph.
04. Universal.
105. Profusion.
106. Market King.
107. Multiple.
108. The 'V.C.'
109. Prince of Peas.
110. Centenary.
111. Up-to-Date.
112., 113. Quite Content.
114. King George.
115. Stourbridge Marrow.
116. Clipper.
117. Hercules.
118. Warriston Wonder.
119. Ne Plus Ultra.
120. Moneymaker.
121. Goldfinder.

DESCRIPTIONS AND NOTES.

NOTE.—In order to reduce the length of descriptions as far as possible the following particulars, which are not repeated in the description below, are given in the Table (p. 513), viz.: Seed colour and form, the date when crop was ready for picking, the number of days between germination and first flowering, full flowering and maturing of crop, the number of days to 'slatting,' that is between flowering and the appearance of the developing pod, and whether mildew-free or not. These particulars may be easily ascertained by reference to the Table under the number of the variety tried

A. FIRST MID-SEASON VARIETIES.

Above $1\frac{1}{2}$ feet and under 3 feet.

Seed Round.

6. Blue Beauty (Hurst).—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching above ground level; internodes short; pods mostly in pairs, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas large, 6 or 7 in pod, tightly packed, of fair flavour. Crop good. One rogue with marrow pods.

5. Buttercup (Carter), **XXX** July 17, 1916.—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching above ground level; internodes short; pods mostly in pairs, curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas of medium size, 6 to 8 in pod, tightly packed, of fair flavour. Crop good.

4. Pride of the Market (Carter).—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, slightly curved, pointed, kinked near stalk, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas of medium size, 6 to 8 in pod, tightly packed, of fair flavour. Crop medium.

45. Second Early Round (Hurst).—Height 2 feet to 3 feet; haulm rather slender, rather light, branching at ground level; internodes long; pods in pairs, curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas of medium size, 5 or 6 in pod, tightly packed, of fair flavour. Crop good.

Seed Wrinkled.

1. Daisy (Carter).—Height 2 feet to 3 feet; haulm sturdy, dark, branching at ground level, internodes short, pods mostly in pairs,

slightly curved, pointed, 3½ to 4 inches long, inflated, pale ; peas large, 6 to 8 in pod, tightly packed, of fair flavour. Crop good.

2. Daisy (Simpson), **XXX** July 17, 1916.—Height 2 feet to 2 feet 6 inches ; haulm sturdy, dark, branching at ground level ; internodes short ; pods mostly single, slightly curved, pointed, 3½ to 4 inches long, inflated, pale ; peas large, 6 to 8 in pod, tightly packed, and of fair flavour. Crop good. Differed from No. 1 in having less flat, rounder pods.

11. Favourite (Sutton), **XXX** July 17, 1916.—Height 2 feet 6 inches to 3 feet 6 inches ; haulm sturdy, dark, branching above ground level ; internodes short ; pods mostly single, straight, blunt, 3½ to 4 inches long, inflated, pale ; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good.

3. The Sherwood (Simpson).—Height 2 feet to 3 feet; haulm sturdy, dark, branching above ground level ; internodes short ; pods mostly single, straight, blunt, 3 to 3½ inches long, inflated, dark ; peas of medium size, 6 to 8 in pod, tightly packed, of fair flavour. Crop medium.

8. Warwickshire Pride (Simpson).—Height 2½ feet to 3½ feet ; haulm sturdy, dark, branching above ground level ; internodes long ; pods mostly single, curved, pointed, 4 to 4½ inches long, inflated, light ; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium. One rogue with narrow pods.

43. Yorkshire Hero (Sutton).—Height 2½ feet to 3½ feet ; haulm sturdy, dark, branching at ground level ; internodes short ; pods mostly in pairs, straight, blunt, 3 to 3½ inches long, inflated, pale ; peas large, 6 or 7 in pod, tightly packed, of good flavour. Crop good.

B. Above 3 feet and under 4½ feet.

Seed wrinkled.

14. Abundance (Sutton).—Height 3 feet to 4 feet ; haulm sturdy, dark, branching above ground level ; internodes short ; pods borne mostly single, straight, blunt, 3½ to 4 inches long, inflated, light ; peas large, 6 in pod, tightly packed, of fair flavour. Crop good.

12. Commonwealth (Carter), **XX** August 8, 1916.—Height 3 feet to 4½ feet ; haulm sturdy, dark, branching at and above ground level ; internodes short ; pods single or in pairs, straight, some slightly curved, pointed, 4½ inches long, inflated, dark ; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good.

21, 22. Discovery (Sutton, Dickson), No. 21, **XX** August 8, 1916.—Height 3 feet to 4 feet 6 inches ; haulm sturdy, dark, branching at ground level ; internodes long ; pods single or in pairs, straight, pointed, 4½ to 5½ inches long, inflated, pale and dark ; peas large, 7 or 8 in pod, rather loosely packed, of good flavour. Crop medium. No. 21 had some narrow-leaved rogues with curved pods. No. 22 germinated poorly.

25. Dr. McLean, Improved Strain (Sutton).—Height 3 feet 6 inches to 4 feet 6 inches ; haulm sturdy, dark, branching at ground level ;

internodes short; pods single or in pairs, straight or curved, blunt, 4 to 4½ inches long, inflated, pale; kink in many pods; peas large, 6 or 7 in pod, loosely packed, of fair flavour. Crop good.

7. Evergreen Delicatesse (Carter), **A.M.** July 17, 1916.—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, sickle or straight, pointed, narrow and kinked near stalk, 3½ to 4 inches long, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop good; foliage distinct.

23. King Edward (Sutton).—Height 2 feet 6 inches to 4 feet; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, straight, blunt, 4 to 4½ inches long, inflated, dark; peas large, 6 to 8 in pod, tightly packed, of fair flavour. Crop medium; patchy.

53, 54. Magnum Bonum (Sutton, Barr). No. 54 **A.M.** July 17, 1916.—Height 2 feet 6 inches to 5 feet 6 inches; haulm sturdy dark, branching at ground level; internodes short and long; pods borne mostly in pairs, straight, pointed, 4½ to 5 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, of excellent flavour. Crop good. No. 53 stock not typical.

19. Majestic (Watson & Simpson).—Height 3 feet to 4 feet; haulm sturdy, dark, branching above ground level; internodes short; pods mostly single, straight, pointed, 4 to 4½ inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium.

26, 27. Peerless (Barr, Sutton), No. 27, **XXX** July 17, 1916.—Height 3 feet to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods borne singly and in pairs, curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 8 to 10 in pod, tightly packed, of good flavour. Crop good. No. 26 a poor stock, pods paler and some blunt-podded rogues.

32, 33. Perfection (Carter, R. Veitch).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods borne mostly in pairs, straight, blunt, 3½ to 4 inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop fair. No. 32, some with slightly curved pods, one tall rogue with narrow leaves; No. 33 stouter and bigger leaved, seeds yellow, germination bad.

36, 37. Prince of Wales (Barr, Simpson).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods in pairs, curved, blunt, 3½ to 4 inches long, light; peas of medium size, 7 or 8 in pod, loosely packed, of fair flavour. Crop good.

38, 39. Queen (Simpson, Barr).—Height 2½ feet to 3 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, curved, pointed, 4 to 4½ inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop fair. True stock. No. 38 is not true, being taller, with longer internodes and light pods.

28. Senator (Webb).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, 3½ to 4 inches long, pale, kinked near stalk; peas large, 8 or 9 in pod, tightly packed, and of little flavour. Crop good.

15, 16. Stratagem (Carter, Barr), No. 15 **XXX** July 17, 1916.—Height 3½ feet to 4 feet 6 inches; haulm sturdy, dark, branching above ground level; internodes long; pods single or in pairs, straight, pointed, 4 to 4½ inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. No. 15 crop good. This is 'Standard Stratagem.' No. 16 a bad stock, with rogues with blunt pods; poor crop.

31. Territorial (Hurst).—Height 3 feet to 4 feet; haulm rather slender, dark, branching at ground level; internodes long; pods mostly single, straight back, curved, point blunt, 3½ to 4 inches long, inflated, dark; peas large, 7 or 8 in pod, loosely packed, of good flavour. Crop fair. Good stock.

9. The Newby (Hurst), **A.M.** July 17, 1916.—Height 4 feet 6 inches to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes long; pods single or in pairs, back straight, sharply curved at point, pointed, 4 to 4½ inches long, dark; peas of medium size, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

13. Unique (Sydenham).—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes long; pods single or in pairs, curved, pointed, kinked near stalk, 3½ to 4 inches long, pale; peas of medium size, 6 or 7 in pod, tightly packed, of good flavour. Crop good.

C. Above 4½ feet and under 6 feet.

Seed round.

78. Victorious (Hurst).—Height 5 feet to 5½ feet; haulm delicate, light, branching above ground level; internodes long; pods mostly single, straight, blunt, 3 to 3½ inches long, inflated, dark; peas large, 4 to 6 in pod, tightly packed, of poor flavour. Crop medium. Poor stock with many short curved pods.

Seed wrinkled.

17. Danby Stratagem (Carter), **A.M.** July 17, 1916.—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 in pod, tightly packed, of very good flavour. Crop good. Not 'Stratagem' type.

80. Dawn (Carter).—Height 4 feet 6 inches to 6 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly single, straight, blunt, 3 to 4 inches long, inflated, pale; peas large, 6 to 8 in pod, tightly packed, of good flavour. Crop medium.

73. Edwin Beckett (Beckett).—Height 4½ feet to 6 feet; haulm

delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 3½ to 4 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, of good flavour; seed grey-green. Crop good.

42. Gradus (Simpson).—Height 5 feet to 6 feet; haulm rather slender, light, branching at ground level; internodes long; pods mostly single, curved, pointed, 4 to 4½ inches long, inflated, dark; peas of medium size, 7 or 8 in pod, tightly packed, of full flavour. Crop good.

65. Improved Queen (Carter), **A.M.** July 17, 1916.—Height 4 feet 6 inches to 5 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

51. Jersey Hero (Nutting), **A.M.** July 17, 1916.—Height 5 feet to 6 feet; haulm sturdy, light, branching at ground level; internodes short; pods mostly in pairs, slightly curved, pointed, 4½ to 5 inches long, inflated, pale; peas of medium size, 9 or 10 in pod, tightly packed, of good flavour; a few yellow seeds. Good crop.

30. Plentiful (Hurst).—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, 4 to 4½ inches long, inflated, dark; peas of medium size, 9 or 10 in pod, loosely packed, of good flavour. Crop good, but not as good as 'Senator,' one of the parents.

64. Red Cross (Sim), **XXX** July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly in pairs, curved, pointed, 4½ to 5 inches long, inflated, pale; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop good, but of two types, requires further selection. Some dwarf rogues.

47. Royal Salute (Dickson), **A.M.** July 17, 1916.—Height 4 feet 6 inches to 5 feet 6 inches; haulm sturdy, dark; internodes long, branching at ground level; pods mostly in pairs, straight, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

71. Seedling 230 (Carter).—Height 5 feet 6 inches to 6 feet 6 inches haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, blunt, 3½ to 4 inches long, inflated, dark; peas of medium size, fairly tightly packed, of fair flavour. Crop good, but all at top of haulm.

D. Over 6 feet.

Seed round.

79. Constellation (Hurst).—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 3½ to 4 inches long, inflated, dark; peas of medium size, 7 or 8 in pod, rather loosely packed, of fair flavour. Good crop.

106. Market King (Carter), **A.M.** July 17, 1916.—Height 6 feet to

7 feet; haulm delicate to medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 3½ to 4 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. Crop good, prolific.

107. Multiple (Hurst).—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly in pairs, but some in threes, curved, pointed, 3½ to 4 inches long, inflated, pale; peas of medium size, 7 or 8 in pod, tightly packed, of fair flavour. Crop good.

105. Profusion (Hurst).—Height 7 feet to 8 feet; haulm delicate, light, branching above ground level; internodes long; pods in pairs and in threes, curved, pointed, 3½ inches long, pale; peas of medium size, 7 or 8 in pod, tightly packed, of very good flavour. Big crop, but not quite true.

Seed wrinkled.

95, 96. Alderman (Barr, Simpson), No. 96, **XX** August 8, 1916.—Height 6 feet to 8 feet; haulm delicate to medium, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, 4 to 4½ inches long, inflated, dark; peas large, 8 to 10 in pod, tightly packed, of good flavour. Crop good. In No. 96 the pods were only slightly curved, seed green and yellow, and germination poor, consequently later. See also 'Clipper.'

100. Battleship (Carter).—Height 6 feet to 7 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods single or in pairs, straight, blunt, 3½ to 4 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, and of good flavour. Crop good. Mixed stock, some with curved, pointed pods.

116. Clipper (Sydenham), **A.M.** July 17, 1916.*—Height 6 feet to 7 feet; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, slightly curved at point, pointed 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of very good flavour. Crop good. Of 'Alderman' type, straight, inturned point to pod.

97, 98. Duke of Albany Selected (Sutton, Carter), **A.M.** July 17, 1916.—Height 6 feet to 7 feet 6 inches; haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5½ inches long, inflated, dark; peas large, 8 to 10 in pod, tightly packed, and of good flavour. Crop good. No. 98 sent in as 'Duke of Albany Re-selected,' had very full pods, and came in six days earlier than 97.

101. Duke of York (Cooper-Taber).—Height 6 feet to 7 feet 6 inches, haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, pale; peas large, 9 or 10 in pod, tightly packed, and of good flavour. Crop good.

* Raised to **F.C.C.** in 1917.

81. Essex Wonder (Nutting).—Height 7 feet to 8 feet; haulm of medium strength, light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop medium. Germination poor.

84. Exhibition (Carter).—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods single, curved, pointed, 4½ to 5 inches long, inflated, pale; peas medium to large, 8 or 9 in pod, loosely packed, of good flavour. Crop good.

86. Harvestman (Carter), **A.M.** July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, dark, branching above ground level; internodes long; pods single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 10 or 11 in pod, tightly packed, of good flavour.

85. International (Carter), **A.M.** July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop good.

114. King George (Webb), **XX** July 17, 1916.—Height 6 feet to 7 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 6 inches long, inflated, pale; peas large, 9 to 11 in pod, tightly packed, of good flavour. Crop good.

87. Market Gardener (Carter), **A.M.** July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, 3¾ to 4 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, of good flavour. Crop good.

94. Model Telephone (Carter), **XXX** July 17, 1916.—Height 6 feet to 7 feet; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, pale; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

72. Premier (Bell).—Height 6 feet to 7 feet; haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large. 9 or 10 in pod, of good flavour. Crop and germination poor. Some with blunt pods.

109. Prince of Peas (Sutton), **A.M.** July 17, 1916.—Height 6 feet to 7 feet; haulm delicate to medium, dark, branching above ground level; internodes long; pods single and in pairs, straight, blunt, 4 to 4½ inches long, inflated, pale; peas large, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

70. Queen Mary (Sim).—Height 6 feet 6 inches to 7 feet 6 inches; haulm delicate, light, branching above ground level; internodes long; pods mostly single, straight, blunt, 3½ to 4 inches long, inflated, pale; peas large, 7 or 8 in pod, loosely packed, of poor flavour. Crop medium. Pods all at the top of haulm.

112, 113. Quite Content (Barr, Carter), **A.M.** July 17, 1916.—Height 6 feet to 7 feet 6 inches; haulm delicate to strong, dark and light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, 4½ to 6 inches long, dark and pale; peas large, 8 to 11 in pod, tightly packed, of very good flavour. No. 112 was darker in haulm and pods than 112.

88. Reliance Marrowfat (Webb), **XXX** July 17, 1916.—Height 7 feet to 8 feet; haulm delicate, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, of good flavour. Crop good. Of 'Alderman' type.

93. Saccharine (Sim).—Height 7 feet to 8 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4 to 4½ inches long, inflated, pale; peas large, 8 or 9 in pod, of fair flavour. Crop good.

77. Seedling 231 (Carter).—Height 7 feet to 8 feet; haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, straight, blunt, 3½ to 4 inches long, dark; peas of medium to large size, of fair flavour. Crop good. Stock not yet true.

90. Standard (Barr), **A.M.** July 17, 1916.—Height 7 feet to 8 feet; haulm delicate to medium, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Of 'Alderman' type.

115. Stourbridge Marrow (Webb).—Height 6 feet to 7 feet; haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

Second Mid-Season Varieties.

A. Above 3 feet and under 4½ feet.

Seeds wrinkled.

46. Delicatesse (Carter).—Height 3 feet to 4½ feet; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, 3½ to 4 inches long, pale; peas of medium size, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

66, 67, 68. Glory of Devon (Barr, R. Veitch, Simpson), No. 66, **A.M.** August 8, 1916.—Height 5 feet to 6 feet; haulm sturdy, dark, branching at ground level; internodes long; pods single or in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Distinct foliage. No. 67 not so distinct, more curved and sharper pods than 66, and some pale podded forms. No. 68 dwarfer stock, germination poor, not so good.

24. Invincible Marrowfat (Sutton).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching from ground level; internodes short; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, pale; peas of medium size, 8 or 9 in pod, tightly packed, of fair flavour. Crop good.

74. Lancastrian (Dickson & Robinson).—Height 3 feet 6 inches to 4 feet 6 inches; haulm of medium strength, dark, branching at ground level; internodes of medium length; pods mostly in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop patchy. Some narrow-leaved rogues with smaller pods.

40. Magnificent (Barr), **XX** August 8, 1916.—Height 3 feet to 4 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, 3½ to 4 inches long, inflated, dark; peas large, 6 or 7 in pod, tightly packed, of fair flavour. Crop good. One rogue with curved and pointed pods.

44. Prizewinner (Sydenham).—Height 3 feet to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, curved, pointed, 4 to 4½ inches long, inflated, dark; peas of medium size, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium. Some with straight blunt pods.

10. Nonsuch (Sutton).—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, light; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop poor, germination bad. Thin plant, but vigorous.

48. Paragon (Dickson & Robinson), **XX** August 8, 1916.—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, curved, pointed, 4½ to 5 inches long, inflated, pale; peas of medium size, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Some with blunt pods

20. Prizewinner (Sutton), **XX** August 8, 1916.—Height 3 feet to 4½ feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, pointed, 4½ to 5 inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium. One rogue with blunt pods.

41. Satisfaction (Sutton), **A.M.** August 8, 1916.—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, 4 to 4½ inches long, inflated, pale; peas large, 6 or 7 in pod, tightly packed, of fair flavour. Crop good.

76. Scotsman (Bell).—Height 2 feet 6 inches to 4 feet; haulm sturdy, dark, branching at ground level; internodes sturdy; pods single or in pairs, curved, pointed, 4 to 4½ inches long, inflated, dark; peas of medium size, 7 to 9 in pod, fairly tightly packed, of fair flavour; seed grey-green. Crop medium. Mixed stock.

59, 60. Superlative (Dickson, Sutton).—Height 3½ feet to 4½ feet; haulm sturdy, dark, branching from ground level; internodes short;

pods borne mostly in pairs, slightly curved, some blunt, others pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 to 10 in pod, oosely packed, of good flavour. Crop good.

69. Sensation (Sarsons).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, straight, blunt, 3½ to 4 inches long, inflated, pale; peas large, 6 to 8 in pod, loosely packed, of good flavour. Crop good, but all at top of haulm. Germination bad.

82, 83. William Richardson (Barr, Nutting), No. 83, **XX** August 8, 1916.—Height 3 feet 6 inches to 4 feet; haulm sturdy, dark, branching at ground level; internodes sturdy; pods single or in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 7 to 10 in pod, tightly packed, of good flavour. Crop good. No. 82 had some with straight pods.

B. Above 4½ feet and under 6 feet.

Seeds wrinkled.

57, 58. Best of All (Sutton, Barr), No. 57, **XX** August 8, 1916.—Height 3 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, pointed, 4 to 4½ inches long, inflated, dark; peas of medium to large size, 7 or 8 in pod, tightly packed, of good flavour. In No. 58 the seeds were green and yellow, rather loosely packed, and three rogues.

56. Continuity (Sutton), **A.M.** August 8, 1916.—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, 3½ to 4 inches long, inflated, dark; peas of medium size, 6 or 7 in pod, tightly packed, of good flavour. Crop good.

34. Eureka (Sutton).—Height 4 feet to 5 feet; haulm sturdy, light, branching at ground level; internodes short; pods mostly in pairs, curved, pointed, 4½ to 5 inches long, inflated, pale or dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. Crop fair, but uneven.

35. Eureka (Sydenham), **XXX** July 7, 1916.—This is 'Best of All,' q.v., the dark podded selection of 'Eureka.'

29. G. F. Wilson (Carter).—Height 4 feet to 5 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods single or in pairs, curved, blunt, 4 to 4½ inches long, inflated, dark; peas of medium size, 7 or 8 in pod, tightly packed. Crop good. One tall rogue, smaller pods. An old variety, now superseded

61. Incomparable (Sutton), **XX** August 8, 1916.—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, 4 to 4½ inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good. Some plants with pointed pods.

55. Masterpiece (Sutton), **A.M.** August 8, 1916.—Height 4 feet 6 inches to 5 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, 4½ to 5

inches long, inflated, dark ; peas large, 7 to 9 in pod, loosely packed, of good flavour. Crop good. True.

63. Matchless (Sutton), **A.M.** August 8, 1916.—Height 5 feet to 6 feet ; haulm sturdy, dark, branching at ground level ; internodes long ; pods mostly in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark ; peas large, 7 or 8 in pod, loosely packed, of good flavour. Crop good.

89. Nonsuch Marrowfat (Webb).—Height 5 feet to 5 feet 6 inches ; haulm sturdy, dark, branching above ground level ; internodes short to medium ; pods mostly in pairs, slightly curved, pointed, 4½ to 5 inches long, inflated, dark ; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop good. Somewhat similar to ' Best of All.'

52. Perpetual (Sutton), **A.M.** August 8, 1916.—Height 4 feet 6 inches to 6 feet ; haulm sturdy, dark, branching at ground level ; internodes short ; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark ; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

50. Prolific Marrow (Sutton).—Height 4 feet to 5 feet ; haulm rather delicate, light, branching above ground level ; internodes long ; pods single or in pairs, straight, blunt, 4 to 4½ inches long, inflated, dark ; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop medium.

62. Supremacy (Hurst).—Height 5 to 6 feet ; haulm sturdy, dark, branching at ground level ; internodes variable ; pods mostly in pairs, curved, pointed, 4 to 4½ inches long, inflated, dark ; peas of medium size, 7 to 8 in pod, tightly packed, of good flavour. Crop good.

18. The Victor (Johnson), **XXX** August 8, 1916.—Height 4 feet to 5 feet ; haulm sturdy, dark, branching at ground level ; internodes long ; pods single or in pairs, curved, pointed, 5 to 5½ inches long, inflated, pale or dark ; peas large, 8 or 9 in pod, loosely packed, of fair flavour ; seed grey-green. Crop good. A few narrow-leaved rogues, pods pale and dark.

91. Union Jack (Hurst).—Height 5 feet 6 inches to 6 feet ; haulm delicate to medium, dark, branching above ground level ; internodes short to medium ; pods mostly single, curved, pointed, 4 to 4½ inches long, inflated, dark ; peas large, 7 to 8 in pod, tightly packed, of very good flavour. Crop good.

C. Over 6 feet.

Seed round.

103. Telegraph (Carter).—Height 6 feet to 7 feet 6 inches ; haulm delicate to medium, light, branching above ground level ; internodes long ; pods mostly single, curved, pointed, 3½ to 4 inches long, inflated, pale ; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good.

104. Universal (Hurst).—Height 7 feet to 8 feet ; haulm delicate, light, branching above ground level ; internodes long ; pods mostly in pairs, curved, pointed, 3½ to 4 inches long, pale ; peas of medium size, 7 or 8 in pod, tightly packed, of fair flavour. Crop good.

Seed wrinkled.

110. Centenary (Sutton), **XXX** August 8, 1916.—Height 6 feet to 7 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

102. General Joffre (Hurst).—Height 6 feet to 7 feet 6 inches; haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Germination poor.

75. Gladstone (Sydenham).—Height 6 feet to 7 feet; haulm medium to sturdy, light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop medium. This was not 'Gladstone,' but 'Duke of Albany.' Some plants with blunt pods.

121. Goldfinder (R. Veitch).—Height 6 feet to 7 feet; haulm medium to sturdy, light, branching above ground level; internodes short; pods single or in pairs, curved, blunt, 3 to 3½ inches long, inflated, pale; peas large, 6 or 7 in pod, tightly packed, of good flavour. Crop medium. Of 'Ne Plus Ultra' type, and very similar to it.

117. Hercules (Dickson & Robinson).—Height 6 feet to 7 feet; haulm delicate to medium, light, branching above ground level; internodes long; pods single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, of very good flavour. Crop medium. Germination poor, and poor plant.

120. Moneymaker (J. K. King).—Height 6 feet to 7 feet 6 inches; haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4 to 4½ inches long, inflated, pale and dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. Crop good. Of 'Alderman' type, but a few differences.

119. Ne Plus Ultra (Sydenham), **XX** August 8, 1916.—Height 7 feet to 8 feet; haulm medium to sturdy, light, branching above ground level; internodes short; pods single or in pairs, curved, blunt, 3 to 3½ inches long, inflated, pale; peas large, 6 or 7 in pod, tightly packed, excellent flavour. Crop good.

99. Prior (Eckford).—Height 6 feet to 8 feet 6 inches; haulm medium to sturdy, light, branching at ground level; internodes long; pods mostly single, curved, pointed, 4½ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop good.

108. The 'V.C.' (Sutton), **XX** August 8, 1916.—Height 6 feet to 7 feet 6 inches; haulm of medium strength, light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, 5½ to 6 inches long, inflated, pale; peas large, 8 in pod, of fair

flavour. Crop medium. Point of pod at side, and 13 peas in some pods. Rather paler than 'Quite Content.'

92. Thousandfold (Hurst).—Height 7 feet to 8 feet; haulm medium to delicate, dark, branching at ground level; internodes of medium length; pods in pairs, many in threes, slightly curved, blunt, 3 to 3½ inches long, inflated, pale; peas of medium size, 7 in pod, tightly packed, of fair flavour. Crop good.

118. Warriston Wonder (Bell).—Height 7 feet to 8 feet; haulm medium to sturdy, light, branching above ground level; internodes long; pods mostly single, slightly curved, blunt, 4 to 4½ inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of very good flavour; seed grey-green. Crop good.

111. Up-to-Date (Sutton), **XX** August 8, 1916.—Height 6 feet to 7 feet 6 inches; haulm delicate to sturdy, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 5 to 5½ inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

—		No.	Name.	Ready.	No. of days between germination and			Flowering node.	Slatting time in days.	Mildew or not.
					1st flower.	Full flower.	Ready to pick.			
			First Mid-Season Varieties.							
Over 1½ and under 3 ft.	Seed round, green	6	Blue Beauty .	July 18	47	61	90	10–12	4–8	Slight
		5	Buttercup . .	18	57	64	90	11–13	6	,,
		4	Pride of the Market	15	52	59	81	13–17	7	Mildew
		45	Second Early Round	15	47	61	87	9	4–8	,,
	Seed wrinkled, green	1	Daisy . . .	15	45	59	81	9–12	7–8	,,
		11	Favourite . .	8	41	59	84	8–9	4	None
	Seed wrinkled, green and yellow.	2	Daisy. . .	14	37	54	81	9	4–6	Mildew
		3	The Sherwood .	14	41	59	80	8–10	3–8	,,
		8	WarwickshirePride	17	52	69	88	12–14	4–6	Slight
		43	Yorkshire Hero .	21	52	65	90	13	8	Mildew
Above 3 and under 4½ ft.	Seed wrinkled, green	14	Abundance .	15	40	57	84	10–11	3–4	Slight
		12	Commonwealth .	12	55	67	77	12–14	7	None
		21	Discovery . .	21	46	61	93	10	5–8	,,
		22	,, . .	20	58	68	92	12–13	6	,,
		25	Dr. McLean, Improved Strain	20	58	68	92	13	6	,,
		23	King Edward .	14	49	61	86	10	4–6	,,
		19	Majestic . .	20	54	62	89	14	6	Mildew
		26	Peerless . .	20	61	70	96	12	6	None
		27	,, . .	20	58	65	92	14	5	,,
		28	Senator . .	17	51	61	89	13	9	Mildew
		15	Stratagem . .	18	55	65	87	12	3–4	None
		16	Stratagem (extra selected)	18	54	63	84	10	4	Mildew
		31	Territorial . .	12	41	56	84	8	5–7	None
		13	Unique . .	20	49	62	89	12–14	4–8	Mildew
	Seed wrinkled, green and yellow	7	Evergreen Delicatesse	18	42	57	84	11–14	8	Slight
		54	Magnum Bonum, selected	19	58	70	93	14	6	None
		32	Perfection . .	24	58	67	93	14	5	,,
		36	Prince of Wales .	17	52	62	86	14	4–9	Mildew
		37	,, ,, .	15	52	65	84	14	6	,,
		38	Queen . .	21	55	65	90	12–13	6	None
		39	,, . .	21	35	64	87	14	4–7	Mildew
		9	The Newby .	17	51	61	89	9–13	4–8	Mildew

Height	—	No.	Name.	Ready.	No. of days between germination and: 1st flower.	Full flower.	Ready to pick.	Flowering node.	Slatting time in days.	Mildew or not.
				July						
Above 4½ and under 6 ft.	Seed round, green	78	Victorious	12	52	62	84	10	4–7	Mildew
	Seed wrinkled, green	17	Danby Stratagem	17	60	67	91	11–13	5	None
		80	Dawn	14	51	61	86	12	3–7	Mildew
		73	Edwin Beckett	12	43	52	84	11	3–8	,,
		65	Improved Queen	24	60	67	98	13	6	None
		30	Plentiful	19	58	66	91	14	6	,,
		64	Red Cross	19	53	63	93	14–17	8	,,
		47	Royal Salute	20	60	67	94	13	7	,,
		71	Seedling 230	15	55	70	87	15	3–6	Mildew
	Seed wrinkled, green and yellow	42	Gradus	12	41	51	83	10	6	None
		51	Jersey Hero	14	61	68	86	17	7	,,
Over 6 ft.	Seed round, green	79	Constellation	13	52	59	84	12	8	Mildew
		106	Market King	12	54	60	86	14	4–7	,,
		105	Profusion	21	57	67	95	15	6	None
	Seed round yellow	107	Multiple	20	57	67	94	14	8	Mildew
	Seed wrinkled, green	95	Alderman	14	60	67	88	15	5	None
		116	Clipper	20	55	65	92	15	7	Mildew
		97	Duke of Albany, selected	20	52	65	92	14	8–9	,,
		98	Duke of Albany, reselected	14	61	65	86	15	7	,,
		81	Essex Wonder	20	49	64	86	14	7	,,
		84	Exhibition	20	57	64	91	15	6	Badly
	Seed wrinkled, green	86	Harvestman	14	52	61	86	13	9	,,
		85	International	14	54	63	88	15	9	,,
		114	King George	17	55	65	89	15	8	Mildew
		87	Market Gardener	12	43	61	84	15	3–5	Badly
		94	Model Telephone	20	51	65	92	14	10	Mildew
		72	Premier	20	43	61	92	15	8	,,
		109	Prince of Peas	14	51	61	86	14	7	,,
		70	Queen Mary	14	47	61	86	14	5	,,
		112	Quite Content	20	55	65	92	14	9	,,
		113	,, ,,	17	55	65	89	14	8	,,
		88	Reliance Marrowfat	20	55	65	92	14	6	,,
		93	Saccharine	21	52	65	93	15	9	None
		90	Standard	15	52	65	87	14	9	Mildew
		115	Stourbridge Marrow	14	55	65	86	12–14	4–6	,,
	Seed wrinkled, yellow	77	Seedling 231	21	51	65	93	14	9	,,
	Seed wrinkled, green and yellow	96	Alderman	20	55	65	92	14	7	None
		100	Battleship	21	54	63	95	14	8–9	,,
		101	Duke of York	20	52	65	92	14	8	Mildew

SECOND MID-SEASON VARIETIES.

Height	—	No.	Name.	Ready.	1st flower.	Full flower.	Ready to pick.	Flowering node.	Slatting time in days.	Mildew or not.
				July						
Above 3 and under 4½ ft.	Seed wrinkled, green	46	Delicatesse	21	55	62	90	13	5	None
		66	Glory of Devon	29	61	70	101	15	6	,,
		67	,, ,,	24	60	67	98	14	6	Mildew
		68	,, ,,	29	58	67	98	15	4	None
		24	Invincible	28	55	65	97	13	5	,,
		53	Magnum Bonum	29	58	70	101	14	6	,,
		10	Nonsuch	29	52	64	95	10–12	4	,,
		48	Paragon	24	58	65	95	13	7	,,
		20	Prizewinner	24	58	67	93	12	4	Slight
		76	Scotsman	29	58	70	101	12	6	Mildew
		59	Superlative	29	58	70	101	14	6	None
		60	,,	29	58	70	101	14	6	,,
		82	William Richardson	28	61	70	100	14	8	,,
		83	,, ,,	29	60	69	100	14	4	,,
	Seed wrinkled, yellow	69	Sensation	29	52	64	95	14	6	,,
		33	Perfection	30	52	64	96	10	6	,,
	Seed wrinkled, green and yellow	74	Lancastrian	22	60	64	93	15	4	,,
		40	Magnificent	24	60	74	95	14	4	,,
		44	Prizewinner	29	48	70	101	14	4–7	,,
		41	Satisfaction	29	58	70	101	13	5	,,

—		No.	Name.	Ready.	No. of days between germination and			Flowering node.	Slatting time in days.	Mildew or not.
					1st flower.	Full flower.	Ready to pick.			
Above 4½ and under 6 ft.	Seed wrinkled, green	57	Best of All .	July 24	58	70	96	14	5	None
		58	,, ,, .	24	60	69	95	14	4	,,
		56	Continuity . .	24	61	69	96	14	5	,,
		34	Eureka . .	25	57	69	96	12	4	,,
		29	G. F. Wilson .	24	51	61	95	12	4–7	,,
		61	Incomparable .	24	61	70	95	14	4	,,
		55	Masterpiece .	24	61	69	96	14	4	,,
		63	Matchless . .	29	61	69	101	14	7	,,
		89	Nonsuch Marrowfat	24	58	70	96	14	7	,,
		52	Perpetual . .	21	61	72	93	11	5	,,
		50	Prolific Marrow .	24	58	67	93	14	5	,,
		62	Supremacy .	24	55	65	96	14	7	,,
		18	The Victor . .	24	58	68	96	11–12	5	Mildew
		91	Union Jack .	20	52	62	89	14	9	,,
	Seed wrinkled, green and yellow	35	Eureka . .	28	57	65	99	12	6	None
Over 6 ft.	Seeds round green	103	Telegraph . .	20	49	67	94	15	4–6	Mildew
		104	Universal . .	21	54	67	95	14	8	None
	Seed wrinkled, green	110	Centenary . .	20	51	65	92	14	7–9	Mildew
		117	Hercules . .	20	51	66	89	14–15	6–7	,,
		108	The 'V.C.' .	20	55	65	92	14	6–7	,,
		92	Thousandfold .	29	63	72	103	16	9	None
		118	Warriston Wonder	20	55	65	92	14–15	8	Mildew
		111	Up-to-Date .	20	51	70	92	14–16	7–9	,,
	Seed wrinkled, yellow	121	Goldfinder . .	24	58	67	93	14	7	None
	Seed wrinkled, green and yellow	102	General Joffre .	21	47	61	93	14	5–7	Mildew
		120	Moneymaker .	20	57	64	91	15	6	None
		119	Ne Plus Ultra .	24	61	65	96	14–16	7	,,
		99	Prior . . .	24	47	66	96	14	5	,,
		75	The Gladstone .	20	50	69	91	14	9	Mildew

LATE PEAS AT WISLEY, 1917.

FIFTY-EIGHT stocks of peas were sent for trial as late varieties in 1917. They were sown on May 5 in trenches which had a good dressing of manure applied during March and April. The ground in 1916 had been occupied by cabbages. The sowing was early for late peas, but the Wisley rainfall being usually light the comparatively early sowing and elimination of all varieties which came in before a fixed date were considered the best means of securing a fair trial. In spite of the dry weather following sowing, germination of all the stocks was excellent and good growth was made. The Fruit and Vegetable Committee examined the trial on July 27 and eliminated the varieties which could not be considered late ones, and finally judged them on August 17, recommending awards as noted below.

Awards recommended in the present trial.

Award of Merit.

24. Latest of All, sent by Messrs. Barr.
57, 58. Longstander, sent by Messrs. Sutton and Messrs. Barr.
42. Rearguard, sent by Messrs. Hurst.

Highly Commended (**XXX**).

30. Autocrat, sent by Messrs. Simpson.
23. Perpetual Bearer, sent by Messrs. Barr.
2. Reliable, sent by Messrs. Harrison.
12, 14. The Gladstone, sent by Messrs. Simpson and Barr.

Commended (**XX**).

25. Anticipation, sent by Messrs. Carter.
20. Late Queen, sent by Messrs. Nutting.
45. Michaelmas, sent by Messrs. Barr.
55. Ne Plus Ultra, selected, sent by Messrs. Barr.

Of these, stocks under the same name had received awards in previous trials as follows: Autocrat (**F.C.C.** 1885, J. Veitch); The Gladstone (**F.C.C.** 1902, Mr. Holmes); Late Queen (**A.M.** 1900, Messrs. Barr).

Of other stocks in the trial the following under the same name had in earlier years received awards, but they were this season adjudged of less merit than those to which awards were recommended: Nos. 27, 28. Continuity (**A.M.** July 1898, and August 1916, Messrs. Sutton).

VARIETIES.

†1. * Superb.
2. Reliable.
†3. James Kelway.
†4. Stratagem.
5. } Englishman.
6. }

* See footnote, p. 107.

† These varieties were ready before July 27, and are to be regarded as early or mid-season varieties. They are therefore not further referred to.

†7. Glory of Somerset.
†8., †9. Veitch's Perfection.
†10. Walker's Perpetual.
†11. Follower.
12., 13., 14., 15., 16. The Gladstone.
17. Selected Gladstone.
†18. Sutton's Perfection.
19., 20. Late Queen.
21., 22. Dreadnought.
23. Perpetual Bearer.
24. Latest of All.
25. Anticipation.
26. Sutton's Perpetual.
27., 28. Continuity.
29. Victory.
30., 31., 32. Autocrat.
33., 34. Autocrat.
35. Glory of Ross.
†36. Glory of Devon.
37. Hancock's Exhibition.
†38. Sutton's Exhibition.
†39. Matchless.
40. Matchless Marrowfat.
†41. Lord Leicester.
42. Rearguard.
43., 44. Latest Giant.
45., 46. Michaelmas.
†47. The Langport.
†48. Old England.
†49. Good Indeed.
50. The Britisher.
†51. Alderman Selected.
†52. Achievement.
53. Late Duke.
54. Ne Plus Ultra re-selected.
55. Ne Plus Ultra selected.
56. Goldfinder.
57., 58. Longstander.

Descriptions and Notes.

Note.—In order to reduce the length of descriptions as far as possible the following particulars, which are not repeated in the description below, are given in the Table (p. 520), viz.: Seed colour and form, the date when the crop was ready for picking, the number of days between germination and first flowering, full flowering and maturing of crop, the number of days to "slatting," that is between flowering and the appearance of the developing pod, and whether mildew-free or not. These particulars may be easily ascertained by reference to the Table under the number of the variety tried.

Above 3 feet and under 4½ feet.

25. Anticipation (Carter), **XX** Aug. 17, 1917.—Height, 4 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne singly and in pairs, straight, pointed, 4–5 inches long, inflated, pale; peas large, 6 to 8 in pod, tightly packed, and of good flavour; seed grey-green. Crop good.

27, 28. Continuity.—See p. 512.

37. Exhibition (Hancock).—Height, 3 feet 6 inches to 4 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, slightly curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, and of fair flavour. Crop poor.

35. Glory of Ross (Holmes).—Height, 3 feet to 3 feet six inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods single or in pairs, curved, pointed, 4 to 5 inches long, inflated, pale; peas large, 7 to 10 in pod, tightly packed, of fair flavour. Crop good.

43, 44. Latest Giant (Barr, Carter).—Height, 3 feet to 4 feet;

† These varieties were ready before July 27, and are to be regarded as early or mid-season varieties. They are therefore not further referred to.

haulm sturdy, dark, branching at and above ground level; internodes short; pods borne singly and in pairs, curved, pointed, 3½ to 5 inches long, inflated, dark; peas large, tightly packed, and of good flavour. Crop good. No. 44 had some straight-podded rogues.

23. Perpetual Bearer (Barr), **XXX** Aug. 17, 1917.—Height, 4 feet to 4 feet 6 inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly in pairs, curved, blunt, 3 to 3½ inches long, pale; peas large, 6 or 7 in pod, tightly packed, and of fair flavour. Crop good.

2. Reliable (Harrison), **XXX** Aug. 17, 1917.—Height, 4 feet to 4 feet 6 inches; haulm fairly sturdy, variable, dark, branching at and above ground level; internodes rather long; pods borne singly, straight, pointed, 3 to 4 inches long, dark; peas of medium size, 7 to 9 in pod, tightly packed, and of fair flavour; seed green, a few yellow.

29. Victory (Hurst).—Heigth, 3 feet 6 inches to 4 feet 6 inches; haulm rather delicate, light, branching at and above ground level; internodes of medium length; pods borne singly and in pairs, curved, pointed, 4 to 4½ inches long, pale; peas large, 8 or 9 in pod, tightly packed, and of good flavour; seed grey-green. Crop good. Several rogues, stronger with larger pods.

Above 4½ feet and under 6 feet.

30, 31, 32, 33, 34. Autocrat (Simpson, Sydenham, Barr, R. Veitch, Nutting; J. Veitch), No. 30, **XXX** Aug. 17, 1917.—Height, 4 feet to 5 feet; haulm very sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, straight, blunt, 3 to 4 inches long, inflated, dark; peas large, 6 to 8 in pod, tightly packed and of good flavour. Crop good. Nos. 31, 32, 33, 34, had each one or two rogues.

21, 22. Dreadnought (Barr, Carter).—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, straight, blunt, 3½ to 4½ inches long inflated, dark; peas large, 6 to 8 in pod, tightly packed, and of good flavour. Crop good. No. 21 had seeds of two colours.

5, 6. Englishman (Kelway, Barr).—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes long; pods borne singly and in pairs, curved, pointed, 3½ to 5 inches long, inflated, dark; peas large, 6 to 9 in pod, tightly packed, and of good flavour. Crop good. No. 5 had some light-podded rogues and seeds of two colours, and in No. 6 the pods were only slightly curved and the haulm was variable in strength.

53. Late Duke (Carter).—Height, 5 to 6 feet; haulm delicate, pale, branching at and above ground level; internodes long; pods curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, of good flavour. Crop good.

19, 20. Late Queen (Sutton, Nutting), No. 20 **XX** Aug. 17, 1917.—Height, 5 feet to 5 feet 6 inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne singly and in pairs, straight, blunt, 3½ to 4 inches long, very inflated, dark; peas large, 5 to 7 in pod, packed rather loosely, and of good flavour. Crop good. No. 19 had some rogues with smaller pods, and was more single-podded, with crop only fair.

24. Latest of All (Barr), **A.M.** Aug. 17, 1917.—Height, 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods produced singly and in pairs, straight, blunt, 3 to 4 inches long, inflated, dark; peas large, 6 to 8 in pod, and of good flavour. Crop good.

40. Matchless Marrowfat (Barr).—A mixed stock.

45, 46. Michaelmas (Barr, Carter), No. 45 **XX** Aug. 17, 1917.—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods produced mostly singly, straight, some slightly curved, blunt, 3 to 4 inches long, inflated, dark; peas large, 6 to 8 in pod, tightly packed, and of good flavour. Crop good. No. 45 had several tare-leaved rogues, and some with pointed pods.

26. Perpetual (Sutton), **A.M.** Aug. 8, 1916.—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods produced singly and in pairs, straight, pointed, 4 to 4½ inches long, much inflated, dark; peas large, 7 or 8 in pod, tightly packed, and of good flavour. Crop good.

42. Rearguard (Hurst), **A.M.** Aug. 17, 1917.—Height, 4 feet to 5 feet 6 inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, curved, pointed, 4½ to 5½ inches long, inflated, dark, peas large, 8 to 10 in pod, tightly packed, and of fair flavour. Crop good.

50. The Britisher (Kelway).—Height, 3 feet 6 inches to 4 feet; haulm sturdy, dark, branching at and above ground; internodes short; pods mostly in pairs, nearly straight, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 to 10 in pod, tightly packed, of fair flavour. Crop good. Not quite true.

12, 13, 14, 15, 16, 17. The Gladstone (Simpson, Hurst, Barr Sydenham, R. Veitch, Sutton), Nos. 12 and 14, **XXX** Aug. 17, 1917.—Height, 4½ feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes long; pods borne mostly singly, curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, and of good flavour. Crop good. No. 17 is called The Gladstone Selected, and had green seeds. No. 12 had green seed and some rogues with blunt and light pods. Nos. 13 and 16 had shorter nodes. In No. 16 the pods were lighter in colour.

Over 6 feet.

57, 58. Longstander (Sutton, Barr), **A.M.** Aug. 17, 1917.—Height, 6 feet to 8 feet; haulm rather delicate, light, branching at and above

ground level; internodes long; pods mostly singly, slightly curved, blunt, 4 to 5 inches, inflated, dark; peas large, 6 to 8 in pod, tightly packed, and of good flavour. Crop good. No. 58 had green seeds, was dwarfer than 57, and crop not so heavy.

54, 55. Ne Plus Ultra re-selected (Carter, Barr). See p. 515.

—		No.	Name.	Ready.	No. of days between germination and			Flowering node.	Slatting time in days.	Mildew or not.
					1st flower.	Full flower.	Ready to pick.			
				Aug.						
Over 3 and under 4½ ft.	Seed wrinkled, green	25	Anticipation	13	34	52	83	13	6	Slight
		27	Continuity	13	31	52	80	16–17	6	Badly
		28	"	13	32	53	80	16–17	5–6	"
		37	Exhibition	8	31	49	81	15–16	6–7	"
		35	Glory of Ross	8	34	49	81	15–16	6–7	None
		43	Latest Giant	8	34	55	81	14–15	5–6	Slight
		44	" "	10	32	54	82	16	5–6	Badly
		2	Reliable	8	33	55	80	18–19	5–6	Mildew
		29	Victory	8	27	46	75	16–17	5–6	"
	Seed wrinkled, yellow	23	Perpetual Bearer	13	36	49	83	17	7–8	None
Over 4½ and under 6 ft.	Seed wrinkled, green	22	Dreadnought	13	38	50	80	17	6–7	Mildew
		6	Englishman	6	33	58	80	15–16	5–6	"
				July						
		12	Gladstone	30	32	53	67	18	7–8	None
		13	"	30	39	57	73	17–18	5–6	"
				Aug.						
		17	" selected	4	37	54	75	21–22	5–6	"
		19	Late Queen	15	37	50	81	17	5–6	"
		20	" "	15	38	51	81	17	6–7	"
		24	Latest of All	17	38	51	83	15–16	6–7	Slight
		45	Michaelmas	17	39	56	91	17–18	8–9	Badly
		46	"	17	41	57	91	17	5–6	"
		26	Perpetual	13	45	64	82	18	5–6	Slight
		42	Rearguard	17	45	55	91	15–16	6–7	"
	Seed wrinkled, green and yellow	30	Autocrat	17	35	55	85	17	6	Mildew
		31	"	17	44	60	90	17	7–8	Slight
		32	"	17	42	58	92	15–16	6–7	"
		33	"	17	36	59	91	17–18	6–7	"
		34	"	15	41	59	89	15–16	5–6	"
		21	Dreadnought	13	33	47	81	18	5–6	None
		5	Englishman	10	35	54	81	16	5–6	Slight
		14	The Gladstone	8	38	54	79	17	6	None
		15	"	4	40	57	78	17	5–6	"
		16	"	8	35	52	77	19	5–6	"
		53	Late Duke	6	31	52	77	15	6–7	Slight
		40	Matchless Marrowfat	13	34	53	87	15–16	6–7	Mildew
		50	The Britisher	8	26	49	81	16	6–7	Badly
Over 6 ft.	Seed wrinkled, green	58	Longstander	8	38	60	81	19–20	6–7	Slight
	Seed wrinkled, green and yellow	57	Longstander	9	38	60	82	18	6–7	Slight
		54	Ne Plus Ultra, re-selected	8	35	54	81	19	6	Mildew
		55	Ne Plus Ultra, selected	13	37	54	86	17	6–7	Slight

REPORT OF THE CONSULTING CHEMIST FOR 1917.

By Dr. J. A. VOELCKER, M.A., F.I.C., F.L.S., &c.

THE applications made in 1917 to the Consulting Chemist were more numerous than in 1916, twenty-eight samples being sent for analysis in place of thirteen in the previous year. These analyses comprised:

Meat meal	1
Poultry manure	1
Potash materials	4
Concentrated manure	1
Hair waste	1
Destructor refuse	1
Sewage sludge	1
Compressed oats mixture	1
Waters	2
Soils	15
	28

1. *Meat Meal.*—This was sold as containing 30 per cent. of phosphates and 8·5 per cent. of ammonia, the price charged being, in November 1917, £16 a ton. Analysis showed it to have:

	Per cent.
Phosphates	24·99
Ammonia	9·32

There was, thus, a deficiency of 5 per cent. of phosphates and an excess of 0·80 per cent. in ammonia, these about balancing one another in value; but the price was an exceedingly high one, and should not have been nearly so much.

2. *Poultry Manure.*—The sample sent of this gave:

	Per cent.
Moisture	56·80
Organic matter and salts of ammonia	18·11
*Phosphoric acid	1·50
Lime	9·00
Magnesia, alkalies, &c.	6·94
Sand	7·65
	100·00
Nitrogen	1·02
Equal to ammonia	1·24
*Equal to phosphate of lime	3·28

3. *Potash Materials.*—The search for materials containing potash has been, in the absence of the German potash salts, very active, and the need of them has been particularly felt in the horticultural world. Consequently, a number of materials have been examined in the hope of their containing potash. Three such were the following:

	A Per cent.	B Per cent.	C Per cent.
Moisture	3·38	4·81	7·87
Organic matter	7·06	5·31	8·02
Mineral matters insoluble in water	72·40	68·50	71·50
Mineral matters soluble in water	17·16	21·38	12·61
	100·00	100·00	100·00
Potash (total)	13·35	16·98	13·16
Equal to sulphate of potash	24·71	31·43	24·36

These all contained distinctly good amounts of potash, and, as the price in each case was only 7*s.* 6*d.* per unit of sulphate of potash, they were quite worth getting in these times when potash is so much required and supplies are so scarce.

At the same time they were all of them markedly alkaline, though both chloride and sulphate of potash were present, and it would not do to use them mixed with sulphate of ammonia or other ammonia-containing manures, as ammonia would be thereby lost.

Another material sent for estimation of potash was a waste vegetable product, and this analysed as follows:

	Per cent.
Moisture	12·64
Organic matter	76·65
*Phosphoric acid	1·04
Lime	0·83
Oxide of iron, alkalies, &c.	5·04
Siliceous matter	3·80
	100·00
*Equal to phosphate of lime	2·27
Nitrogen	2·95
Equal to ammonia	3·58
Potash	2·07

4. *Destructor Waste.*—The sample sent me was ash from a destructor in which the excreta of hospital patients was incinerated, and with it was mixed clinker and other waste material. The analysis was:

	Per cent.
Moisture	1·60
Organic matter, carbon, &c.	4·87
Oxide of iron and alumina	20·17
*Phosphoric acid	3·22
Lime	7·69
Potash	1·54
Soda	2·37
Magnesia	1·06
Carbonic acid, chlorine, &c.	2·63
Insoluble siliceous matter	54·85
	100·00
*Equal to phosphate of lime	7·03
Nitrogen	0·06
Equal to ammonia	0·07

This was distinctly richer than ordinary destructor waste, the amounts of phosphate of lime and potash being sufficiently high to

constitute manurial value apart from the mechanical advantages of using such material on land, especially heavy land, that wanted "opening out." The nature of the crude matter used, and the very complete burning, accounted largely for this superiority.

5. *Sewage Sludge.*—This material was being used to dig into garden soil. It was, however, of decidedly low quality and had, as will be seen, nearly 75 per cent. of water. It was reckoned to cost 5*s*. per ton; but this was more than it was worth, and, unless where soil may be deficient in vegetable matter or at all likely to "burn," it is doubtful if such sludge is worth applying.

The analysis was:

	Per cent.
Water	74·67
Organic matter	11·59
Oxide of iron and alumina	1·86
Lime	0·96
Potash	0·05
*Phosphoric acid	0·41
Magnesia &c.	1·14
Sand	9·32
	100·00
Nitrogen	0·19
Equal to ammonia	0·23
*Equal to phosphate of lime	0·89

6. *Waters.*—In consequence of a complaint sent me that Peaches and Vines in several houses had been injured, while in others no harm had been experienced, an inquiry was pursued in respect of the water supply, and particulars were obtained as to what had been the treatment in the different houses. It was stated that the leaves of Peaches and Vines decayed after watering, and that with Tulips the flowers became spotted and the leaves died back. On the other hand, in a Vinery where only "damping" had been done, but no syringing, the Vines were unaffected.

It was ascertained that the water supply came from two sources, the one a lake, the other a well. The locality was in Dorsetshire, quite close to the sea. Water was normally raised from the lake by means of a ram, but, the ram having got out of order, the water from the well had been used all the winter and spring. The ram having been put in order again early in May, the supply from the lake was used on May 10, and by May 13 the injury aforesaid was noticed. I had samples of the two waters sent me, and the analyses of these were:

	Lake water. Grains per gallon.	Well water. Grains per gallon.
Total solid matters	200·48	20·16
Oxydizable organic matter	0·98	4·03
Nitric acid as nitrates	·07	·07
Chlorine	98·66	4·96
Equal to chloride of sodium (common salt)	162·49	8·18

It will be seen that the lake water contained a very excessive amount of salt, which probably had filtered in from the sea, and this undoubtedly had been the cause of the injury to the plants. The presence of

magnesia salts in some quantity in the lake water confirmed that it was sea water that had found its way in.

7. *Soils.*—Several samples were submitted to me, the majority, however, showing no special features. The following, however, may be of interest :

(*a*) Soil for apple trees. A partial analysis gave :

(Soil dried at 100° C.)

	Per cent.
Organic matter and loss on heating	5·62
Oxide of iron and alumina	7·22
Lime	2·68
Phosphoric acid	0·10
Alkalies, &c.	1·40
Insoluble silicates and sand	82·98
	100·00

The soil was one of loose, much broken-up character, and had had acetylene refuse dug into it. It contained some leaf mould, but, nevertheless, was not really rich in vegetable matter, and though there seemed to be ample lime, this was not well distributed through the soil, but collected in lumps. Further, the soil was decidedly poor in phosphoric acid, and, for apple-growing, should have phosphates applied to it freely, either as bone meal or as basic slag. I should consider the above not a good soil for apples, and that it wanted more consolidation as well as more manuring.

(*b*) *Soil for Fruit-growing.*—A sample of grass-land was sent me for the purpose of seeing if, when ploughed up, it would be suitable for fruit-growing, and eventually for apples and pears. A partial analysis gave :

(Soil dried at 100° C.)

	Per cent.
Organic matter and loss on heating	10·42
Oxide of iron and alumina	11·52
Lime	0·66
Phosphoric acid	0·15
Magnesia, alkalies, &c.	1·09
Insoluble silicates and sand	76·16
	100·00

Here, again, phosphoric acid is not sufficiently present, and, though there may not be an actual deficiency of lime, I should consider the further application of this desirable. In all such cases, too, it is very necessary to consider not merely the quality of the soil, but also whether there be a good depth of it.

DONORS OF SEEDS, PLANTS, BOOKS, &c., TO THE SOCIETY'S LABORATORY AND GARDEN AT WISLEY DURING THE YEAR 1917.

ALLGROVE, J. C., Slough. Raspberry 'The Devon.' Included in trial.
ALLWOOD, Messrs., Haywards Heath. Collection of Perpetual Flowering Carnations.
BACON, C. H., Sherborne. Achillea. Included in trial.
BAKER, F. H., Melbourne, Australia. Seeds of Acacia &c. Sown.
BAKER, Messrs., Codsall. *Chrysanthemum maximum* varieties (included in trial); *Gentiana lagodechiana* (planted in garden).
BALFOUR, Prof. I. B., Edinburgh. *Primula chrysopa.* Growing on.
BARR, Messrs., London. Stocks; Poppies (see p. 483); Broad Beans (see p. 160); Leeks; Peas (see p. 516); Beet (see pp. 488, 495); Potatos; Medicinal Herbs (grown in garden); *Thunbergia Gibsoni* (plants raised); Campanula 'Telham Beauty' (planted in garden); Pumpkins and Squashes; Lettuce (included in trial); Spinach; Cow Wheat.
BECKETT, E., V.M.H., Elstree. Collection of Shrubs. Planted in garden.
BELL, D., Leith. Beet 'Bell's Deep Blood Red' (see p. 488); Broad Bean 'The Cropper' (see p. 160).
BENNETT, Mrs., Louth. Seedlings of *Thalictrum dipterocarpum.* Planted in garden.
BONAPARTE, Monsieur Le Prince, Paris. Papers for Library.
BOND, Mrs., Wareham. Seed of German Lentils.
BRANNAM, Messrs., Barnstaple. Flower pots for trial.
BRODRIBB, A. H., Guildford. Hollyhock seed. To be sown.
BROWN, Mrs., Brighstone, I.W. Seeds of various Olearias. Sown.
BROWN, W., Mayfield. *Chrysanthemum maximum* 'Mayfield Giant.' Included in trial.
BRUNTON, J. S., Burnley. 'Carnation Year Book.' For Wisley Library.
BRYANS, A., London. Seeds from Kashmir. Sown.
BUNYARD, E. A., Maidstone. Gordon's Pinetum. Deposited in Library.
BUNYARD, Messrs., Maidstone. Broad Bean 'Bunyard's Prizetaker Exhibition Long Pod' (see p. 160); Beet 'Bunyard's Intermediate' (see p. 488); Raspberries (included in trial).
BURPEE, Messrs. W. ATLEE, Philadelphia. Lettuces (included in trial); climbing Beans (to be tried 1918).
CARTER, Messrs., Raynes Park. Beet and Lettuce. Included in trials.
CLIBRANS, Messrs., Altrincham. Beet 'Deep Blood Red' (see p. 488).
COLLIER, W. A., Redbourn. *Chrysanthemum maximum* 'Marion Collier.' Included in trial.
COOPER, TABER & Co., Messrs., London. Lettuce and Beet (pp. 488, 495). Included in trials.
CRANE, D. B., London. Seed of climber from Portuguese East Africa. Sown.
CREWDSON, W., St. Leonards-on-Sea. Seed of Japanese Radish and Corean White Cabbage.
CUTBUSH, Messrs., Highgate. Perpetual-flowering Carnations.
CUTHBERTSON, F. G., San Francisco. Seeds of *Clarkia pulchella* and *C. elegans* for comparison.
DANIELS, Messrs., Norwich. Beet and Lettuce. Included in trials.
DAWKINS, A., Chelsea. Beet and Lettuce. Included in trials.
DAWSON, C., Christchurch. Collection of seeds from Salonica and neighbourhood. Sown.
DIVERS, W. H., V.M.H., Grantham. Rhubarb 'Tobolsk'; *Anemone Pulsatilla* 'Belvoir Red'; *Aconitum septentrionale* (planted in garden); eyes of Grape 'Black Morocco' (growing on). Winter-flowering Begonia seed.
DOBBIE, Messrs., Edinburgh. Poppies (see p. 483); Onions (see pp. 147, 156); Pea 'Dobbie's Selected Alderman' (see p. 516); Broad Beans (see p. 160); Leeks; Beet (see p. 488); Shallot 'Dobbie's Large Red Exhibition' (see p. 146); artificial manure for potatos; Lettuce (included in trial); cuttings of Pelargonium regale × tomentosum (growing on).
DUNEDIN BOTANIC GARDEN, New Zealand. Collection of seeds. Plants raised for distribution.
FIDLER, Messrs., Reading. Potato 'St. Malo Kidney' (see p. 135).

FLEMYNG, Rev. W. W., Waterford. Seeds of *Eucalyptus coccifera, Pyrus japonica,* and *Azalea mollis*. Sown.
FLETCHER, Messrs., Ottershaw. Seedling Aucuba. Planted in garden.
FORBES, Messrs., Hawick. Stocks.
FRASER, G., Ucluelet, British Columbia. Hybrid Gooseberries. Planted in collection.
FRENCH, Messrs., Birmingham. No. 4 Pneumatic Sprayer.
FULFORD, F., Tarbolton. P.F. Carnation 'Mrs. James Arthur.'
GALT, A. S., Leeds. Cuttings of Apple 'Fillingham Pippin.'
GARDINER, W. H., Thorrington. Seeds of Eschscholzias (see p. 167).
GODFREY, W. J., Exmouth. *Chrysanthemum maximum* 'Star of Devon' and 'Omega.' Included in trial.
GRANT-DALTON, Miss, Sway. Single pink. Planted in garden.
GRAY, Z., Sandy. Onions (see p. 156).
GREAVES, Miss, Reigate. Seed of *Lonicera quinquelocularis*. Some sown, remainder distributed to Fellows.
GREGORY, Mrs., Leatherhead. Corms of Italian Cyclamen. Planted in garden.
HAMILTON, W. F., Lymington. P.F. Carnation 'Elspeth.'
HANBURY, C., London. Seed of *Clematis Meyeniana*. Sown.
HANBURY, Lady, Ventimiglia, Italy. Collection of seeds. Plants raised for distribution.
HANCOCK, T., Mansfield. Pea 'Hancock's Exhibition' (see p. 516).
HARRISON, Messrs., Leicester. Broad Bean 'John Harrison' (see p. 160); Beet (see p. 488); Peas (see pp. 498, 516); Lettuce (included in trial).
HENRY, Dr., A., Dublin. Seeds of *Pinus canariensis* and *Fraxinus nigra*. Sown.
HILL, A. W., Kew. Seed of Cotton. Plants raised.
HOGG & ROBERTSON, Messrs., Dublin. Potato 'Champion II.'
HOLDER & TILT, Messrs., Birmingham. Broad Bean 'Erdington Gem' (see p. 160).
HOLMES, E. M., Sevenoaks. Seed of *Atropa Mandragora*. Sown in oak wood.
HOLMES, W. G., Tain. Pea 'Glory of Ross' (see p. 516); Potatos (see p. 135).
HURST, Messrs., London. Eschscholzia 'Mikado' (see p. 167); Haricot Beans; Peas (see pp. 498, 516); Lettuce; Beet (see p. 488).
INGWERSEN, W. E. T., Croydon. Collection of plants for rock garden.
JENKINS, E. H., Surbiton. *Anemone nemorosa Allenii*. Planted in garden.
KEEBLE, Dr., C.B.E., Food Production Department. Seed of Prickly Spinach; Madagascar Butter Beans; Nerima long Radish. For trial and experimental purposes.
KELWAY, Messrs., Langport. Peas (see pp. 498, 516); Beet (see p. 488).
KENT & BRYDON, Messrs., Darlington. Beet 'Brydon's Exhibition' (p. 488) Lettuce 'McHattie's Giant.' Included in trials.
KETTLE, J. J., Corfe Mullen. Raspberry 'Lloyd George.' Included in trial.
KEW, ROYAL BOTANIC GARDENS. Collection of seeds (plants raised for distribution); seed of Bromeliad; *Clematis Stanleyi*. Sown.
KING, Messrs. E. W., Coggeshall. Beet (see p. 488); Onions (see p. 147).
LANSDELL, F., West Moors. Poppies (see p. 483).
LAXTON, Messrs., Bedford. Early Dwarf Pea 152/A.
LODER, G. W. E., Ardingley. Collection of shrubs. Planted in garden. Seeds of *Berberis concinna, B. virescens*, and *Magnolia parviflora*. Sown.
LONGSTAFF, Mrs., Wimbledon. Mango plant. Growing on.
LOW, Messrs. S., Bush Hill Park. *Leonotis Leonurus* (growing on); Carnations.
LOWNDES, Mrs. G. R., Ringwood. Seeds from India. Sown.
LUCKHAM, Miss K. E., Cheltenham. Seed of *Gentiana autumnale*. Sown.
MCALISTER, A. W., Dumfries. Potato 'Rob Roy' (see p. 135).
MACGREGOR, D., Shanghai, China. Grafts of dwarf Peach from N. China. Failed to grow.
MCLENNAN, Mrs., Blanefield. Beet 'Bell's Deep Blood Red' (see p. 488).
MARSHALL, Rev. E. S., Taunton. Forms of *Saxifraga rosacea*. Planted in collection.
MASTERMAN, L., Tasmania. Seeds of Parsley, Delphinium, and Hollyhock. Sown.
MATHESON, T., Morpeth. Beet 'Matheson's Selected Northumberland Red.' Included in trial.
MOTT, H. C., Albury, New South Wales. Seed of Sweet Pea.
MOWATT, Mrs., Grayshott. Cetewayo Potatos. Planted in garden (cropped badly).
NORTH-ROW, W., Chelsea. Seeds of Locust Beans and Carlin Peas. Sown.

NOTCUTT, R. C., Woodbridge. Beet (see p. 488); Potato 'Keen's Seedling (see p. 135); cuttings of Cistus &c. (growing on).
NUTTING, Messrs., London. Bean 'Invicta Longpod' (see p. 160); Peas (see pp. 498, 516); Beet (see p. 488); Onions (see pp. 147, 156); Leeks; Lettuce (included in trial).
PHILBRICK, Miss, Halstead. Seed of white creeper. Sown.
PITT, W., Brighton. Patent Dibber. For trial.
PONTING, C., Great Missenden. Potato 'Top Hole.'
REUSS, R. L., Woking. Collection of seeds. Sown.
ROBERTS, J., Tullamore. 'Cooper's Black' Grape. Growing on.
ROSENHEIM, P., East Molesey. Seeds and plants for rock garden.
ROSS OF BLADENSBURG, Sir J., K.C.B., Rostrevor. Collection of seeds. Plants raised for distribution.
SALTER & STOKES, Messrs., Smithfield. Sample of wood tar.
SANDS, W. E., Hillsborough. Potatos (see p. 135).
SIENA, UNIVERSITY BOTANIC GARDEN, Italy. Collection of seeds. Plants raised for distribution.
SIMPSON, Messrs., Birmingham. Stocks; Shirley Poppy (see p. 483); Shallots (see p. 146); Peas (see p. 498, 516); Onions (see pp. 147, 156); Beet (see p. 488); Broad Beans (see p. 160).
SOMERSET, A., Worthing. Elms, Walnuts, and Willows. Planted in garden.
SOMERVILLE, Prof., Oxford. *Scleranthus biflorus*. Growing on.
SPENCER, L. J., London. White Runner Beans. For trial 1918.
STARK, Messrs., Great Ryburgh. Poppies (see p. 483).
STEPHENS, M., Peaslake. Seed of Magnolia. Sown.
STOKES, Lady, Ockham. *Primula japonica* hybrid. Planted in garden.
STOKES, Messrs., Trowbridge. Raspberries. Included in trial. Shallot 'Stokes' 'Selected Large Red' (see p. 146).
SUTTON, Messrs., Reading. Wart-Resistant Potatos (see p. 135); Beet (see p. 488); Broad Beans (see p. 160); Peas (see pp. 498, 516); Onions (see pp. 147, 156); Maize (grown in experimental trial); Lettuce, Beet (included in autumn sown trials).
SYDENHAM, Messrs., Birmingham. Peas (see pp. 498, 516); Broad Bean 'Eclipse Longpod' (see p. 160); Stocks; Eschscholzias; Poppies (see p. 483); Leek 'The Lyon'; Beets (see p. 488); Lettuce.
TAYLOR, Mrs., Pyrford. Books for Library.
THRUPP, A. C., Kamloops, British Columbia. Seeds of 'Johnny Jump-up' and Red Cedar. Sown.
TOOGOOD, Messrs., Southampton. Beet and Lettuce. Included in trials.
TURVEY, R., Cranleigh. Orchids. Added to collection.
UNWIN, Miss, Farnham. Crinum, Acidanthera, and other roots from Nigeria. Growing on.
UPPSALA BOTANIC GARDEN, Sweden. Collection of seeds. Plants raised for distribution.
VEITCH, Messrs., Exeter. Poppies (see p. 483); Eschscholzias; Onions (see pp. 147, 156); Stocks; Shallots (see p. 146); Peas (see 498, 516); Broad Beans (see p. 160); Leeks; Beet (see p. 488); Lettuce (included in trial); Potatos (see p. 135).
VEITCH, Sir HARRY, V.M.H., London. Vols. 2 and 3 'Plantæ Wilsonianæ' and pamphlets, 'Orchid Review' 1916. Deposited in Wisley Library.
VILMORIN, Messrs., Paris. Haricot Beans.
VOSS, Messrs., Millwall. Voster, Creol, and Catterscab.
WATKINS & SIMPSON, Messrs., London. Stocks; Eschscholzias.
WEBB, Messrs., Stourbridge. Lettuce (included in trial); Beet (included in trial).
WEST, W., Holt Hatch. Grape 'Princess of Wales.' Growing on.
WILKS, Rev. W., V.M.H., Shirley. Seeds of *Lychnis Arkwrightii* (plants raised), *Anemone alpina sulphurea*, *Euonymus latifolius*. Sown. Shirley Poppy and *Verbascum Lychnites* for distribution to Fellows.
WILSON, Dr. J. H., St. Andrews. Seeds of Rubus.
WOODWARD, Mrs., Bewdley. Seeds of *Paeonia Woodwardii*. Sown.
YOKOHAMA NURSERY Co., London. Seed of Prickly Spinach.

COMMONPLACE NOTE.

PRESERVING APPLES AND PLUMS.

By T. H. DIPNALL, F.R.H.S.

FELLOWS of the R.H.S. may be interested to know the following methods of preserving Apples and Plums respectively, one of which I have found successful on personal trial, and the other I learnt from a neighbour, whose statements I have every reason to believe are quite trustworthy, and who said he had seen and tried fruit preserved in this way. The latter plan I only heard of the other day (in April), but when the plum season comes round again I hope to test it for myself; even if it were a failure, it would only entail the loss of a pound or two of fruit, for one would not experiment with a large quantity at first.

Anyone who has Apple trees growing in grass has found in February and March quite sound fruit hidden among the herbage, unhurt by the weather and quite firm and free from shrivelling. Having heard at different times that Apples would keep well if clamped like potatos, and with the knowledge that they often kept well lying perdu in the orchard, I determined to try clamping them myself. The variety experimented with was 'D'Arcy Spice Pippin,' one of the best flavoured of late dessert apples, but one which I have never succeeded in keeping much later than the end of February in the apple cellar without shrivelling. Last autumn there was a very heavy crop of these, and out of a heap put on a loft for sale early in the New Year I had a bushel and a half of sound, firm fruit picked out and a small clamp made of them in the garden at the beginning of January. Various circumstances prevented me from having the clamp made earlier in the season, otherwise I should have done so about the end of November, as soon as the fruit had finished sweating. A bed of clean wheat straw was made on the soil and the fruit heaped up on this, then the heap was covered with straw and earthed over in exactly the same way as one clamps potatos or mangolds. They were then left untouched till about ten days after Easter, when I opened the clamp to try them. Out of about half a peck of fruit taken out up to the present, four or five, which were evidently specked when clamped, had begun to go bad. The rest were perfectly firm and sound and the flesh was softer and juicier and, if anything, sweeter than in the case of apples kept exposed to the air, while in flavour they are quite equal to any I have tasted. The skins, apart from a little earth which had sifted through the straw on to them, were clean and smooth, but slightly damp and sweaty and wanted washing or rubbing with a cloth before use. I have been told that the skins

of clamped Apples have an unpleasant flavour, but I have not tried them, as all apple skins are too tough for my teeth nowadays. Next autumn, as the first trial has turned out so well, I mean, if the fruit crop fulfils the present promise of the blossom, to experiment with other varieties. If clamping will keep 'Cox's Orange Pippin' firm and juicy till April, as I believe it would, it is a method well worth adopting with choice fruit, at any rate when there is a big crop.

The system of preserving Plums which, as I have said, I have not yet been able to try, is a variation of the common practice of bottling and a very simple one, having the usual object of excluding all air from the fruit. In this case, however, heat is not used as a sterilizing agent, it is a cold-water method. All the apparatus required is screw-stoppered bottles, a vessel deeper than the bottles to stand them in, and a plentiful supply of cold water. Having prepared the bottles in the usual way, seeing that they are quite dry and clean, fill them with fruit from which the bloom has been carefully wiped, taking care to use only fruit which is quite sound and free from bruises. Then fill the bottles to the brim with cold hard water, and, placing them in the deeper vessel under the tap or pump, let the water run into this, or keep on pumping into it till the bottles are absolutely free from air bubbles. As soon as this happens, screw the lids down tight on the bottles *under water*, then take the bottles out and store them for use when required. That is all, and, if effective, it is certainly a very easy and inexpensive method. Whether other fruits would keep well preserved in this way I do not know, but one would think that it might be adopted for such things as green gooseberries and tomatos at least. Of course the fruit would need more cooking when used, as it would be quite raw in the bottles and not partially cooked, as is generally the case.

BOOK REVIEWS.

"Rhododendrons: in which is set forth an Account of all Species of the Genus Rhododendron (including Azaleas) and the various Hybrids." By J. G. Millais. La. 4to. xi + 268 pp. Plates. (Longmans, Green, London, 1917.) £8 8*s*. net.

This is a large book; but not too large. Its pages measure 15½ inches in height by 12 inches in width, but the plates require all of this if justice is to be done to the noble proportions of the flowers they are to depict. It is a heavy book, for it weighs 10½ lb.; but this is no detriment, for the library table must needs be called into requisition when it is being used. It is conceived in an ample spirit; but not too ample when one remembers the tremendous range of forms which it must survey. It is a costly book; but not too costly if worthy plates are to be included, and paper and type, extent and style are to be given, as they are, fitting to the great genus it deals with. Its subject is a great one; the number of species in the genus is enormous, and known forms are continually being added to as Chinese exploration extends; they are great in beauty for the most part, from the heath-covering forms of the Tibetan uplands to the giants of the Sikkim Himalaya, and the Azaleas of the North American flora; and their value in the English garden is great too, for some are hardy all over the British Isles, others at home in the temperate house, and others in warmer quarters, while the mild south-west gives hosts congenial homes. It only just misses to be a great book, and this because it betrays here and there just a trace of haste.

It is somewhat strange that there are so few popular books on Rhododendrons, next to the Rose probably the most generally useful genus of garden shrubs. The reason, perhaps, is that most of them require ample quarters to display their beauty. At the same time it is probable that if such popular literature were available, the cultivation of many of those forms known at present only in the gardens of the few would become more wide-spread. The range of season covered by one or other—*Rhododendron arboreum* in November to *R. maximum* in July, the range of colour from yellow and white to the nearly blue of *R. intricatum*, and the range of size from the pigmies through those of medium size to the giants of the race towering many times the height of a man, and their varying degrees of hardiness combine to furnish subjects for all situations where lime is not. The difficulties which surround the cultivation of some make them beloved of the amateur, while the rich reward in beauty that so often follows efforts to obtain new forms gives them value in the eyes of the hybridist. Who will not bless Mr. Mangles' memory when he sees Rhododendron

'Loder's White,' one of the choicest of Griffithianum's numerous progeny? and who would not be happy to raise a counterpart of it? Sir E. Loder's magnificent *R.* × *Loderi*, the popular 'Pink Pearl,' as to the origin of which there seems some doubt, and in the cultivation of which there are such frequent errors, and many another, spur the seed-raiser on to hope for still further beauties in store.

The plates are, of course, a feature of the book. They are of three types: collotype plates, which are magnificent, giving as well as black and white can give the values and texture of the superb plants they represent; half-tone plates, which too are excellent, representing in some cases the plants growing in their native habitats by means of the fine photographs taken by Mr. G. Forrest, with which the Fellows of our Society will be familiar; and coloured plates from paintings representing plantings of Rhododendrons and also portraits of individual flower clusters. A coloured plate of such a grouping in the garden as Rhododendrons can give must lose something in its reproduction, and though these are excellent, yet that glory of high June which thoughts of Azaleas and Rhododendrons at the zenith of their flowering arouse is somehow missed, perhaps because the gloss or the grey of the rhododendron foliage is not easy to portray, or because the atmosphere of a June day cannot be expressed in a coloured plate. Of them all, perhaps, Thorburn's "Knaphill Nursery in June" pleases us best. Some of the individual trusses shown are good, but all would, we think, have been better for the elimination of the background which they have been given—too much like the heavy leaden hues of the out-of-focus parts of a colour-photograph. We need another Redouté; but perhaps a good deal might be learned by a patient study of that master's methods and a great forward step achieved in the faithful and artistic picturing of flowers even yet.

The text is the work, so far as the first part is concerned, of Mr. J. G. Millais, and his previous works on birds and beasts have made his style and powers familiar to every lover of fine books. He gracefully acknowledges the help he has had from Sir Edmund Loder, Messrs. P. D. and J. C. Williams, and Prof. Bayley Balfour, who has done so much of late to clear up difficult questions on the classification of the genus as new material from the Himalaya and from China has become available, and to Mr. J. Hutchinson of Kew. The last-named gentleman has drawn up a key to the identification of the cultivated species of the genus. Such a key should be of great assistance in discovering the name of an unknown form (so long as it has been described), and it forms a useful introduction to the alphabetical arrangement of technical descriptions of species (many of them from material supplied by the Edinburgh Botanic Garden), which follows along with various notes of historical and cultural value. These descriptions comprise more than half the letter-press, and for the first time bring together descriptions of the species and hybrids comprising the genus.

The earlier chapters treat of the Love of Gardening and Gardens, the General Distribution of the Species, Chinese Rhodendrons, Hybrid

Rhododendrons with a list of hybrids, Cultivation, Rhododendrons for every month, and Gardens where Rhododendrons are an especial feature.

"The Book of the Peony." By Mrs. Edward Harding. 8vo. 259 pp. (Lippincott, London, 1917.) 25*s*. net.

The first book devoted to the Pæony hales from America, where the cultivation of these glorious flowers of early summer has been taken up with an enthusiasm almost unknown on this side of the Atlantic, much as many of us appreciate their beauty and value in the garden.

The text is both interesting and valuable ; the plates, both coloured (twenty in number) and black and white, are excellent ; the clear type, the ample margins, the rather old-fashioned paper, the uncut edges, all make a book the book-lover may desire, and the garden-lover wish to purchase for reference as well as for merely reading.

What the French and English growers began to develop and carried to a great pitch, the American nurserymen have continued ; and where America has drawn much from our own country in the past, we may hope to be repaid by further beauties in the future, though we need not, with the incoming of new species of Paeonia from China and elsewhere, rest content with our laurels.

The Tree Pæonies have not yet come to their own in England. Here and there we hear of wonderful successes with them. That remarkable plant in Mr. E. Taylor's garden in Norfolk, which, when eighty years of age and fifteen feet in diameter, bore 400 flowers, is enough to show what *Paeonia Moutan* at its best is capable of, and to make us wish to emulate the success there achieved. Perhaps the stock leaves something to be desired, for Tree Paeonies as propagated in France are nearly always on *P. albiflora* stocks, and Japanese plants are grafted on wild *P. Moutan*. It may be, perhaps, that *P. lutea* will furnish a better stock, or *P. Delavayi* ; but, in any case, both these at present rather uncommon plants are well worth a place in our gardens. *P. lutea* has, as our readers know, produced more than one good hybrid with *P. Moutan*, none better so far than 'La Lorraine,' raised by M. Lemoine of Nancy, and exhibited in 1912.

Useful keys, descriptions of species and of the varieties best known in cultivation, combine to make this an excellent monograph upon a very fine genus.

"Cotton and Other Vegetable Fibres." By Ernest Goulding, D.Sc., F.I.C., with a preface by Wyndham R. Dunstan, C.M.G., LL.D., F.R.S., Director of the Imperial Institute. Imperial Institute series of Handbooks to the Commercial Resources of the Tropics. 8vo. 231 pp. (John Murray, London, 1917.) Price 6*s*. net.

Probably few persons not directly concerned in the trade are aware of the number of fibres of vegetable origin that enter into commerce, and perhaps still fewer are acquainted with the botanical and geographical origin of the supplies that reach this country. This may to some extent be accounted for by the fact that hitherto the literature on this subject has been scattered through technical journals and scientific works that have not been readily available to

the general reader. In this latest addition to the Imperial Institute Series of Handbooks to the Commercial Resources of the Tropics, Dr. Goulding has brought together in a readable form and in small compass an accurate account of the sources, both botanical and geographical, of all the fibres of commerce, and has described their production and preparation for export and, where possible, has given statistical data to indicate their importance as articles of trade. To describe the utilization of fibres fully would have needed a much larger volume than the present, but sufficient has been said with regard to the chief uses to which each fibre is applied to enable the reader to gauge its present and future importance in commerce.

The more important fibres, such as jute and cotton, are of tropical and sub-tropical origin, but there are others of great utility, such as flax and hemp, that might be produced in this country. Prior to the outbreak of war Russia and Belgium supplied the bulk of the world's flax, and Russia the greater part of the hemp; but in view of the present condition of these two countries some years must elapse before they can again supply the world's demand for these fibres. In view of this it would appear desirable for agriculturists in this country to devote some attention to these crops, both in their own interests and in the interests of those home industries that depend on flax and hemp as raw materials for their manufactures. In the preface which he contributes to this book, Professor Dunstan emphasizes the importance of increasing the production of fibres within the Empire, and in this connexion it is to be hoped that all horticulturists and agriculturists who migrate overseas after the war will provide themselves with a copy of this book as a reminder of what it may be possible for them to accomplish in the way of fibre production.

The book is well printed and free from errors; it contains twelve plates illustrating the more important fibres, but it is to be hoped that future editions will include illustrations of little-known fibre-yielding plants, if these can be supplied without unduly increasing the present moderate cost of the book.

"The Chrysanthemum." By C. Harman Payne. 8vo. (Reprinted from the Transactions of the Japan Society of London, vol. xv.)

This artistic and neatly printed pamphlet contains, in a condensed form, the substance of an afternoon's chat on some historical and literary aspects of the Chrysanthemum. The occasion was the opening of the winter session of 1916 of the Japan Society by Sir Albert Rollit, at whose invitation Mr. Harman Payne discoursed upon the subject, illustrating his remarks by a large number of lantern slides, some of which had been specially prepared for the meeting.

Of these slides twenty-four are beautifully reproduced in collotype in the pamphlet. They represent some of the first introductions into this country, from China, a century or so ago; one or two views of Chrysanthemums in the garden of the Emperor of Japan, and quite a number of reproductions of huge single, very quaint, specimen blooms of the Kiku, as grown in Japan.

The text contains references to the Li-ki of Confucius, the first Oriental author known to have mentioned the Chrysanthemum, to T'ao-yuan-Ming, a famous cultivator of the flower in the fifth century A.D., and to others down to Joseph Hardy Neesima, the young Christian Japanese through whose instrumentality the famous 'Mrs. Stephens' Hardy Chrysanthemum, the first of the Hairy Section, was introduced into Western gardens. But a very small edition has been printed.

"Science and the Nation." Ed. by A. C. Seward, with an Introduction by the Rt. Hon. Lord Moulton. 8vo., xxii + 328 pp. (University Press, Cambridge, 1917.) 5s. net.

This symposium is an attempt to establish in the minds of English readers the value of research in pure science, not only for its own sake, but also for the direct influence such research has upon industrial progress. The theme is outlined in an introduction by Lord Moulton, and sustained by Professor Pope (Chemistry), Professor Bragg (Physics), W. Rosenhain (Metallurgy), Professor Hobson (Mathematics), F. W. Keeble (Botany), W. Dawson (Forestry), Professor Biffen (Plant-breeding), T. B. Wood (Agriculture), H. H. Thomas (Geology), Professor F. G. Hopkins (Medicine), Professor Nuttall (Disease), G. S. Graham-Smith (Flies and Disease), W. H. R. Rivers (Government of Subject Races). All the essays are valuable, and nearly all the writers have realized the truth of the quotation from Huxley which backs the title-page, "What people call Applied Science is nothing but the application of Pure Science to particular classes of problems," but in one or two cases it does not seem to be realized that a worker in pure science cannot always see the way in which his discoveries can be applied

to industrial use, even when those discoveries have in the end far-reaching results. Too often, the thinly-veiled feeling of contempt or pity which is felt by the "practical" man towards one whom he thinks stalks through life with his head in the clouds or buried in his apparatus is shared by the "pure science" man—though not often by those at the head of their line on either side—and until each is willing to accept the help of the other the utilization of scientific discoveries for the betterment of the human race and for the increase of industrial prosperity cannot be realized to the fullest extent. The essays in this book should do not a little to bring about that desirable *rapprochement*.

Like all the publications which emanate from the Cambridge University Press this lacks nothing in make up, type and paper being excellent in every way, and the occurrence of so objectionable a form as "preventative" on p. 291 therefore surprises us the more.

"Productive Plant Husbandry." By K. C. Davis. 8vo., xvi + 462 pp. (Lippincott, London.) 7*s.* 6*d.* net.

Judging by the number of books published dealing with agricultural and horticultural instruction in school and colleges, America has realized the importance of systematic teaching in rural subjects in a way that is unknown in England. It may well be that agriculture may be taught in such a way as to be quite useless to the pupil either as a training for the mind or for the practical treatment of soil and crops, on the other hand a carefully planned course of science and practice may be as educational as any subject of the schools and of the greatest practical value.

The present volume deals with the growth and utilization of plants, and illustrates in an excellent fashion the kind of course likely to be useful.

The book would not be entirely suitable for the English student, for the material used for illustration, common in America, is not always to be had here, but for the teacher the whole volume is replete with suggestion and much of the actual work proposed could be used with advantage in courses here. We have great pleasure in recommending the book to all teachers who wish to give a rural bias to their work, and to all students who are seeking a plain statement of the methods of plant production and the reasons for them.

"How to Collect and Dry Flowering Plants and Ferns." By H. S. Thompson, F.L.S. 56 pp. 8vo. (Routledge, London, 1917.) Paper covers, 7*d.* net.

One is often asked for a book giving directions for the preservation of plants for future study. Such directions are often printed, mainly as part of larger volumes; but we have here a handy little book containing all the information likely to be required, and written by one with a long experience of his subject. We can very heartily recommend it to all students and others who seek for information and plain readable directions upon the subject dealt with.

"Manuring for Higher Crop Production." By E. J. Russell, D.Sc., F.R.S Ed. 2. viii + 94 pp. 8vo. (University Press, Cambridge, 1917.) 3*s.* 6*d.* net

"Soil Conditions and Plant Growth." By E. J. Russell, D.Sc., F.R.S Ed. 3. viii + 243 pp. 8vo. (Longmans, Green, London, 1917.) 5*s.* net.

So short a time has elapsed since the first edition of the first of these capital books was published and reviewed in this JOURNAL that we need only draw attention to the new edition. Additions mainly dealing with the breaking up of grass land have been made, and the whole forms a very useful guide to the treatment of land for farm crops.

A third edition of the second volume also calls for little remark except that it, too, contains several alterations in the text, and is brought up to date by the inclusion of a chapter on colloids so far as the soil is concerned with them.

The book is essentially a monograph on the soil, and a review of the present position of soil science.

"Grow Your Own Vegetables." By S. C. Johnson. 199 pp. 8vo. (Unwin, London, 1918.) 6*s.* net.

In these days when allotments have sprung up in such vast numbers everywhere, and are likely still to extend in all parts of the kingdom, this is a most welcome book, as there are so many problems that puzzle the allotment holder that he will be glad to have the advice so fully afforded and so clearly explained. The numerous diagrams are a great aid, and will be much appreciated. It is a book we can confidently recommend.

"The Small Garden." By Mary Hampden. 294 pp. 8vo. (Jenkins, London, 1918.) 5*s*. net.

The authoress has written a very interesting book, containing a mass of useful information and advice that will be valuable for possessors of small gardens; but there are a few things we do not agree with. We cannot endorse what she says on p. 158, as follows: "With all fruit trees that bear in early summer, on walls, there may be light-growing late summer-blooming climbers associated, such as *Cobaea scandens*, Canary creeper, and *Convolvulus major* among the annuals; or the permanent Jackmani Clematis can be cut down to the ground nearly in March, and will come on slowly, attaining height and thickness of growth too late to injure the fruit trees, yet in time to give a splendid blossom before winter." Fruit trees on walls should have the first consideration, and to introduce any of the plants named into or over the trees may have a charming effect, but it will be at the expense of the trees: the young wood is unripened; fruit buds, if any, are weak and poor, or killed outright, and in one or two years such trees are worthless, and to all thinking of such a plan to improve the appearance of their garden, we say "Don't." Again, we think the authoress must be residing in a warm sheltered place, as some of the plants she mentions are tender in the Midlands. Apart from this grumble, we have nothing but praise for the book, which is well printed, contains good plans, embraces a great number of subjects, and well indexed.

"Insect Enemies of the Allotment Holder." By Professor F. V. Theobald, M.A., F.E.S., F.R.H.S. 59 pp. 8vo. (The Author, Wye, Kent, 1918.) Paper covers, 1*s*. 6*d*. net.

Of all the worries to which the grower of vegetables on allotments is subject, none looms so large in his eyes, as a rule, as those due to insect attacks. In this little book we have a safe and comprehensive guide to their treatment. Wireworms, Flea Beetles, Pea and Bean Weevils, Cockchafers, Cabbage Gall Weevils, Cabbage White Butterflies, Surface Caterpillars, Winter and Codling Moths, Onion, Carrot, Celery, Beet, and Cabbage Root Flies, Leather Jackets, Pear Midge, Currant and Gooseberry Sawfly, Apple Sawfly, Aphides, Scale insects, White Fly, Bigbud, Red Spider, Millipedes, Woodlice are all dealt with, and the beneficial insects, Ladybirds, &c., are also referred to. Appropriate methods of control are given where they exist, and useful recipes for the making of insecticides conclude a very handy and reliable little book.

"Strawberry Growing." By S. W. Fletcher. 8vo. 325 pp. (Macmillan, New York, 1917.) 7*s*. 6*d*. net.

This volume is an addition to the well-known Rural Science Series, and deals in great detail with the cultivation and marketing of the Strawberry in the United States. While the bulk of the information is mainly applicable to transatlantic conditions, the progressive grower will pick up many useful hints as to packing and marketing.

From the scientific point of view the chapter on Pollination is interesting as showing that unisexual varieties are still grown in the States. It is curious that these types should persist when they have for so long been discarded in Europe. It is noticeable that varieties of British origin are little grown; we notice only 'Royal Sovereign' in the list, and that is among those of less promise. The writer's experience of American varieties has been one of unbroken failure, and a curious problem in adaptation arises which tempts to further study.

The author may be congratulated on the production of a useful work which should stimulate the economic cultivation of the Strawberry in his own and other countries.

"Rational Fruit Culture." By H. C. Davidson. 8vo. 127 pp. (Garden Life Press, London, 1917.) 2*s*. 6*d*. net.

We must confess to a certain prejudice against the use of such a question-begging word as "rational," whether in matters of dress, ethics, or Fruit Culture. The author justifies his work by a very true criticism of his predecessors' dogmatic methods, his own being to give reasons for all that he advises. When, however, one turns the pages of his work, the bright hopes that we always cherish on taking up a new book rapidly disappear, and one is tempted to think no reason at all is better than a wrong one. Space will not permit a detailed examination of the author's extraordinary blend of fact and fiction, but one or two

examples will serve as a taste of his quality. On page 32 we learn that roots should be trimmed with a knife where injured or broken, if not they will give rise to suckers. It is then carefully explained that these arise solely from the callus formed, the implication being that no callus arises from the trimmed root. Page 2 contains a passage which is worthy of preservation. "Failure to flower may be due to some condition which is merely temporary, such as unfavourable weather, or to one which is more persistent, such as extreme youth." One is reluctant to condemn altogether a work which has certain good points, but when we are shown a picture of a whip graft which is not a whip graft at all, and a Strawberry runner is shown layered in a pot which stands *above* the ground, the author saying that they are thus rather apt to get dry, and therefore runners laid in the soil itself are better, we can but conclude that the writer is better acquainted with the use of the scissors than the spade.

"The Pruning Manual." By L. H. Bailey. 18th edition. 8vo. 407 pp. (Macmillan, New York, 1916.) 8*s.* 6*d.* net.

When a book on Pruning has attained its eighteenth edition and extends itself over 400 pages it presents a solid fact before which the most critical of reviewers must pause.

Prof. Bailey's work is well known on this side of the Atlantic, and the present volume is without doubt the most detailed we have on the subject in English. One defect he shares in common with all writers in our language is the lack of stable nomenclature for various parts of fruit trees. We have recognized the bud, fruit bud, and shoot, but beyond this our vocabulary has not yet extended. When we contrast the greater precision of French writers by the recognition of "dard," "brindille," "courson," &c., it seems high time that we should either translate or naturalize these terms.

We note that Prof. Bailey has left the Lorette system severely alone, and in this perhaps he is wise. Should it raise a bitter polemic in his country comparable with that engendered in France, it is manifestly a sage decision which postpones its discussion until more peaceful days.

Though dealing mainly with fruit trees, there are chapters on Roses and Flowering Tree pruning, and the section on Vine training may be noticed as exceptionally full.

"Roses, and How to Grow Them." By Edwin Beckett. 8vo. 126 pp. (Pearson, London, 1918.) Price 2*s.* 6*d.* net.

Mr. Beckett has acquired much fame as a grower of vegetables, but after carefully reading his book on Roses, we have come to the conclusion that he is equally proficient in the cultivation of the Queen of Flowers, and although the number of books on Roses is so great, there is plenty of room for this one, as it contains just what is wanted by the would-be grower of Roses for home use. The number who grow for exhibition are few compared with those who require Roses for their own pleasure, and we have no hesitation in strongly recommending this well-printed and exceedingly practical handy little volume.

"Forestry Work." By W. H. Whellens. 8vo. 236 pp. (Unwin, London, 1918.) 8*s.* 6*d.* net.

The author's wide experience of forestry on some of the best-wooded estates in this country renders him well suited for writing on the operations that require to be undertaken in connexion with afforestation. It is, however, more a student's book than one for the advanced forester or manager of woodlands, though in the 232 pages a great amount of useful information has been got together. Many of the details given are rarely obtainable in books of the kind, and as the author has a clear way of imparting his knowledge to others, the information contained in some chapters will be all the more valued.

Of the nine chapters into which the book is divided, some of the most important at the present time, when foreign tree seeds and seedling plants are difficult to procure, are the laying out and stocking of the nursery ground; transplanting; formation and tending the plantations; regular and systematic thinning; and final felling and disposing of the crop. Fencing, road and path making, pruning, barking oak, woodland drainage, and a short account of some of the most injurious of forest insects are all useful chapters. What is the most profitable age at which to sell a tree, and the rotations which have proved most profitable are helpful matter.

Several useful tables are given, and the vexed question of measuring timber is touched upon. It would have been useful had the author given some notes on trees and soil, hillside and seaside planting, trees for economic planting, and the formation and tending of game coverts. Our experience with reference to the larch disease or "canker" is that mixed hard-wooded sections are just as badly attacked as are the pure woodlands or where only larch is used. The book, which is rather poorly illustrated, should be found of value to the young forester in particular, though even those further advanced in that profession will find much of interest in its pages.

"Seeding and Planting." A Manual for the Guidance of Forestry Students, Foresters, Nurserymen, Forest Owners, and Farmers. By James W. Toumey. 8vo. 455 pp. (Wiley, New York; Chapman & Hall, London, 1916.) 16*s*. 6*d*. net.

This is by far the most practical and exhaustive work that has yet been published on that most important of forestry operations—collecting and harvesting tree seeds and raising the seedling plants. Every detail, from the choice of trees from which the best seeds may be collected, through all the intricacies of storing, preparing, and sowing the seeds, attending to the seed beds, transplanting, and final planting out, are minutely dealt with, and in such a way that one in reading the various chapters is impressed by the genuineness of the information that is so well and pleasantly imparted. To the casual observer the raising of seedling forest trees may appear a simple matter, but such, in reality, is far from the case; the responsibilities attending choice of seeds, extraction of these from the cones or other seed vessel, storing in such a way that heating or rotting is avoided, preparation of suitable seed beds, best methods of sowing and preserving the seeds from vermin, attending to the young seedlings, and keeping them free from insect and fungus pests, transplanting in order that fibrous roots and bushy plants may be the outcome, and finally lifting, "sheughing," and transplanting to their permanent positions, being only a part of the many operations that require skilful management at the hands of the nurseryman. The chapter on "Establishing Forests by Direct Seeding," which, by the way, has never proved a success in this country, is common-sense and lucid, and may well be successfully carried out in the natural forest, while the notes on tree-planting cannot be too widely appreciated, particularly with reference to too deep planting, bending, and crowding the roots and necessity for firming the soil about the roots. But altogether the book, which extends to 445 pages, with 140 well-executed illustrations, is one of particular value to the student of forestry, and particularly at the present time, when a dearth of both seeds and seedling plants has been occasioned by the war.

"Canning and Bottling: Simple Methods of Preserving Fruit and Vegetables." By Dr. Helen P. Goodrich. 8vo. x + 70 pp. (Longmans, Green, London, 1918.) Stiff covers, 2*s*.

The author compares the value of tins with bottles for the preserving of fruits and vegetables, to the advantage of the former. She gives directions for the preserving of practically all the common fruits and vegetables capable of preservation in bottles, and in the second part of the book the scientific basis of preserving. If her directions are followed there can be no doubt that fruit and vegetable preserving will be successfully carried out; but the author has, we fear, not acquired the faculty of writing in language to be "understanded of the people." We tried the book on (1) a well-read mistress of a household, who protested difficulty in following essential details, and on (2) an intelligent maid, who said she could make little of it, and this is a pity, for so good a book loses most of its value if those for whom it is intended fail in their understanding of it.

"The Book of the School Garden." By C. F. Lawrance. 8vo. xii + 231 pp. (Evans Bros., London, *n.d.* [1918].) 3*s*. 6*d*. net.

This is one of the best of the books of its class which we have come across. It deals with gardening in the school garden and in the allotment. While there are probably no absolutely new things in it, yet the writer has often broken away from the stereotyped method of dealing with his subject and given us a somewhat fresh statement of ideas, and this is just what is so often wanting in such books. Clear, concise, and reasoned directions for work to be done, amply illustrated in many cases by original figures and with an unusual and very useful chapter on home-made appliances, make a book we can cordially recommend. A few misprints may be easily corrected in the next edition, which we anticipate will soon be called for.

"Modern Propagation of Tree Fruits." By B. S. Brown, M.S. 8vo. xi + 174 pp. (Chapman & Hall, London, 1916.) 6*s.* net.

This is a technical handbook intended for the use of students and practitioners of tree fruit propagation. It is written from the American standpoint, and thus differs somewhat from the practice here; but the English nurseryman will not complain of that, for while his methods have been exceedingly successful in the past he is not averse from considering fresh ideas and adopting them if they will fit his aims. Nursery work on a very extensive scale is contemplated in the book as well as the orchard nursery run by the fruit-grower himself.

Various kinds of propagation suitable for different trees and different purposes are described, and though the work is not so full on this part of the subject as, *e.g.*, Baltet's "Grafting and Budding," the chapters on methods of marketing, the working of a nursery, and the like, add a good deal to the literature of nursery work.

"The Flower Garden and How to Work in it." By M. E. Stebbing. 8vo. pp. 174. (Jack, London, 1917.) 1*s.* 6*d.* net.

A well printed and fairly well illustrated work, containing a good deal of useful information for the amateur; but we do wish that all writers who advocate women working in gardens would advise them how to dress for such work. In the illustration showing women hoeing and staking and tying up they have long skirts on, and those who have had such attired people amongst choice flowers know the fearful mess they make, especially if the hems of their skirts get damp. The proverbial bull in a china shop would scarcely cause more havoc. We have nothing to say against women working in the flower garden but insist on the necessity for their dressing properly for the work.

"Jottings of a Gentleman Gardener." By E. T. Ellis. 8vo. 268 pp. (Reeve London, 1917.) 3*s.* 6*d.* net.

This is an excellent book, full of really good information on such subjects a Annuals, Biennials, Perennials, rock-gardens, roses, bulbs, soils and their manage ment, propagation, manures, calendar of operations, &c., &c., all worthy of careful study. The weak portion of the work is the vegetable garden portion at the end of the book. Nothing is said about sowing seeds of vegetables in August on land from which crops have been cleared, such as beet, carrots, onions, &c. that have proved such a splendid addition in many gardens, particularly where the soil is well drained and open. Again, we think more should be said about raising Brussels sprouts, broccoli, borecole, savoys—all most valuable vegetables—and less said about Cardoons, Kohl-rabi, Couve Tronchuda, which are not the most useful things to grow. We disagree that beet will bleed if the roots are broken. We rarely find a root bleed or lose colour when injured or cut through.

"Food, Fruit, and Flowers." By Walter P. Wright. 8vo. 336 pp. (Dent, London, 1917.) 5*s.* net.

We cannot do better than quote some remarks of the author in his preface: "In anticipation of food scarcity and of a long period of national impoverishment after the war, it is desirable that our systems of gardening should be reviewed. Flower-gardening must be pursued in a more simple and economical spirit, and I have made it my business to show in these pages that a change can be made without causing any loss of beauty or interest, &c." Admirably has the author fulfilled his task in the well-written book before us, and it should be read by all who are anxious to make the most of every portion of their garden. We are not in entire accord with his selection of varieties of fruit to plant. Worcester Pearmain is a second-rate apple. Bramley's Seedling is too diffuse in its habit for a small garden, and Pitmaston Duchess is splendid in appearance, but there its good qualities end. However, tastes differ fortunately, and the book is really first-rate.

"Vegeculture." By Harry A. Day. 8vo. 152 pp. (Methuen, London, 1917.) 1*s.* 6*d.* net.

This is a particularly useful book to read and study now, when it is the duty of all of us to produce as much good food as possible, and it will be an excellent guide to the amateur and less experienced cultivator on what to grow and how to grow it. A good index completes the book.

"The Allotment Book." By Walter Brett. 8vo. 92 pp. (Pearson, London, 917.) 1s. net.

A book that will appeal specially to allotment holders, as it will be of great assistance to them in the trials they will meet in cultivating their plots.

"The Potato Book." By J. C. Newsham, F.L.S. 8vo. 92 pp. (Pearson, London, 1917.) 1s. net.

As might be expected from such a well-known author, this handbook is full of sound and valuable information, and all who are interested in potato-growing would do well to read carefully what Mr. Newsham says.

"1,000 Gardening Hints." By H. H. Thomas. 8vo. 152 pp. (Cassell, London, 1917.) 1s. 3*d*. net.

A most useful compilation of excellent hints and recipes on gardening matters, some of which will be appreciated almost daily. A first-rate index is given.

"Rockeries: How to make and plant them." By H. H. Thomas, assisted by S. Arnott. 8vo. 142 pp. (Cassell, London, 1917.) 1s. 3*d*. net.

One of the best handbooks on rock gardens we have seen, and crammed from end to end with a mass of thoroughly sound, practical, well-written matter that will interest the reader immensely.

"Britain's Heritage of Science." By A. Schuster, F.R.S., and A. E. Shipley, F.R.S. 8vo. xv + 334 pp. (Constable, London, 1917.) 8*s*. 6*d*. net.

In perusing a German scientific work one cannot fail to be struck by the copious references given to other papers upon the same subject, and by the apparently remarkable part German and some other Continental scientific workers have taken in developing our knowledge of the particular matter dealt with. British work is often referred to very briefly in such books. Yet, without claiming more than is her just due, we may still claim that not a few of the greatest and most far-reaching conceptions of Nature have had their birth in this land of ours, and not a small part of the developments that have grown out of those conceptions have been due to the devoted and enlightening research of Britain's sons. Why should we, as we so often do, belittle the work of our own countrymen by too loudly belauding that of others? Theirs may be good, and so is ours. Let us not in proud humility stand aside when others make detrimental comparisons between Britain's share in the advancement of knowledge and the shares others have taken, but let us put this book into the hands of our youths to teach them what a heritage has been bequeathed to us by British workers in many fields. It will surely stimulate them to further pursuit of knowledge and awaken a pride in them of careful research.

"The Irish Allotment Book." By L. J. Humphrey. 8vo. 54 pp. and plan. (Kenny Press, Dublin [1918].) Paper covers, 7*d*.

There are so many useful books on allotment gardening as a result of the war conditions as to be almost bewildering. Fortunately most of them insist upon deep cultivation, liming, rational systems of manuring; and the choice of the most valuable crops is insisted upon to occupy the ground. They differ in matters of small details, which are, nevertheless, often important. One can find something one would wish altered in almost all of them, though the good points, as here, generally predominate, so that the book is extremely useful.

The present little book illustrates this. Double-digging can be done by making the second trench equal the first in width, but it can be done more easily by making the first trench six inches wider than the second. The firming of the ground before seed-sowing is a method heartily to be recommended in most soils, but there is no need, in fact there is some danger, in firming it again after the seeds are in. A loose covering on the surface above the seeds is to be preferred to a close one on all counts. A useful set of rules for Allotment Societies is given at the end of the book.

"Modern Fruit Growing." By W. P. Seabrook. 8vo. Pp. 172. (Lockwood Press, London, 1918.) 4*s*. 6*d*. net.

This is one of the most excellent up-to-date books on the subject it deals with that we have seen, but in the next edition we suggest that the title be altered to

"Modern Hardy Fruit Growing," as nothing is included about fruit cultivation under glass.

Now that hardy fruit cultivation is being developed more and more, and is likely to be still further increased in all suitable parts of the country, such a book as this will be of immense service to the grower, and will be a useful guide to him if he will study it carefully, and act on the practical advice so clearly given without any undue verbosity. The questions are often asked how much capital is required an acre to start, the price of the land, terms of tenure, and other very important matters of the same kind ; the selection and preparation of the land, protection from ground game, planting, selection of varieties, stocks, methods of growing, spraying, grading, marketing, &c. &c., all of which need close attention to obtain success, and though the fruit-grower can follow no hard-and-fast rule, but must be guided by local circumstances to a great extent, he will find the author's practical suggestions of immense help in making up his mind what to do, and how to do it in the most economical and approved style. The whole book is so well written and so plain that every one can clearly grasp what is indicated, and we have no hesitation in strongly recommending it, not only to the intending grower for market, but also to the amateur who is anxious to make the most of his trees.

"Our Vegetable Plot." By S. Graveson. 8vo. 32 pp. (Headley, London [1918]). Paper covers, 7*d*. net.

"The Allotment Month by Month." By R. H. Crockford. 8vo. 28 pp. (Elliott, Stevenage, 1918.) Paper covers, 7*d*. net.

The first of these is a record of a beginner's experience of a year's vegetable growing, the second a kind of calendar with recommendations as to varieties to grow and so on. We especially commend the advice as to thin sowing and early thinning of all vegetables, recommended time and again in the latter, but we fear three inches is too deep for the sowing of peas in many soils.

"Fruit Bottling and Preserving: Practical and Homely Recipes." By Mrs. Edwin Beckett. 31 pp. (Country Life, Ltd., London, 1918.) Paper covers, 9*d*. net.

We recommend this little book for its clear practical directions, which the beginner in fruit bottling will find lead to success if she follow them carefully and fully. Vegetables are not dealt with : they are much more troublesome than fruits to preserve so as to keep well, of good colour, and retaining all their flavour. Jams, jellies, cheeses, and the pulping of fruit are, however, treated of in two very short chapters, while a chapter on preserving fruit in cold water brings a very useful little book to a close.

"Plant Propagation: Greenhouse and Nursery Practice." By M. G. Kains, 8vo. xix + 322 pp. (Orange Judd Co., New York, 1916.) $1.50.

This is a thoroughly up-to-date book upon the general methods of propagation, full of useful hints and methods for shortening processes in nursery work as well as of details of the operations of layering (layerage), making cuttings (cuttage), and grafting and budding (graftage). The words in parentheses are the titles of chapters in the book under review. Some of the methods described are applicable only in districts with very cold winters like the north-eastern States and Canada, but, allowing for this, the English nurseryman and student will find in this book a very useful and enlightening treatise on one of the most important phases of gardening. We especially commend the remarks upon the effect of grafting to those who long for plants upon their own roots, and make didactic statements as to the peculiar value of these above grafted ones.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

THE Editor desires to express his grateful thanks to all who have so willingly assisted in making abstracts. He would be glad if any who have time and who are willing to help in any special direction in making the abstracts more complete would communicate with him.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP IN THIS WORK.

Archer, F. G., F.R.H.S.
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Simmonds, A., F.R.H.S.
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Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
Webster, A. D., F.R.H.S.
Whittles, W., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton	Ann. Rep. Agr. Res. Stn., Long Ashton.
Beiheft zum Botanischen Centralblatt.	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticultura	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal of the Society of Chemical Industry	Jour. Soc. Chem. Ind.

Journals, &c.	Abbreviated title.
Journal S.E. Agricultural College, Wye . .	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst. . .	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia .	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden . .	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Gard.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc. .	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc. .	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc. .	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins .	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports . .	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications .	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.
† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abies cephalonica Loud. By O. Stapf (*Bot. Mag.* t. 8691; Dec. 1916).—Native of Greece, reaching a height of 100 feet in this country.—*F. J. C.*

Abies Fraseri. By A. Bruce Jackson (*Gard. Chron.* May 25, 1918, p. 215; with fig.).—The nineteenth of this series of critical notes on Conifers. Refers to two specimens of this rare fir 15 feet high, planted fourteen years ago at Colesborne.—*E. A. B.*

Absorption of Nutrients as affected by the Number of Roots supplied with the Nutrient. By P. L. Gile and J. O. Carrero (*Jour. Agr. Res.* ix. p. 73, April 1917).—The authors find the absorption of nutrient substances cannot be efficiently compassed if only some of the roots are in contact with the nutrient. This has, of course, a direct bearing upon the method of distributing nutrients in the soil, suggesting that they should be evenly distributed rather than that they should be placed in one part of the soil only.—*F. J. C.*

Alpine and Rock Plants. By J. W. B. (*Irish Gard.* xiii., April 1918, pp. 58–61).—A long and interesting article on a fascinating topic. We are a little surprised to read, however, that "the propagation of alpines presents no unusual difficulties." Seed frequently fails to germinate in a satisfactory manner, seedlings are apt to damp off, and even when cuttings are put in they frequently fail to strike root if they are of the choicer plants. These points should be no deterrent to the alpine gardener, but the statement above is a little misleading.—*E. T. E.*

Aphies abiet (*Irish Gard.* xiii. p. 105, July 1918).—A pest similar to greenfly; very prevalent on *Picea Morinda, Maximowiczii, obovata, omorika, orientalis,* and *sitchensis.*

Two sprayings of tobacco water diluted to $\frac{1}{3}$ strength with water, given at intervals of about a month, will effect a cure.—*E. T. E.*

Aphis, Mealy Plum, Hyalopteris pruni. By J. G. Blakey (*Gard. Chron.* Jan. 5, 1918, p. 1, with 5 figs.).—Records the discovery that eggs are laid on plum from September onward, which remain dormant on the trees, and a large proportion of the insects remain on plum all the year. This makes it doubtful whether previous statements are correct in declaring it to be a form of *H. arundinis* and to pass a great part of the year on grasses.—*E. A. Bd.*

Apple Blotch and its Control. By John W. Roberts (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 534, pp. 1–11, June 1917; 2 plates).—Apple blotch caused by *Phyllosticta solitaria* attacks the twigs, leaves, and blossoms, as well as the fruit of many varieties of apples grown in Southern United States. The fungus can winter in the diseased twigs and infect the young fruits in the following season. The author believes that the "mummified" apples do not cause much infection. The disease is controlled by three sprayings with 3-4-50 Bordeaux mixture at intervals of three weeks, the first being applied about three weeks after the blossom petals have fallen. Lime sulphur solution may be substituted for Bordeaux mixture where the disease is not severe.—*A. B.*

Apple Diseases in Indiana. By H. S. Jackson (*U.S.A. Dep. Agr. Exp. Stn. Purdue, Cir.* 70, pp. 1–23, Sept. 1917; 14 figs.).—This paper describes the appearance, cause, and control measures of the following diseases of apples: (1) Apple Scab Fungus (*Venturia inaequalis*); (2) Apple Rust (Cedar Rust) (*Gymnosporangium Juniperae-virginianae*); (3) Black Rot (*Physalospora Cydoniae*); (4) Bitter Rot (Anthracnose) (*Glomerella cingulata*); (5) Blister Canker (*Nummularia discreta*); (6) Apple Blotch (*Phyllosticta solitaria*); (7) Xylaria Root Rot (*Xylaria* sp.); (8) Sooty Blotch (*Leptothyrium pomi*); (9) Bitter-Pit or Stippen (cause not yet known).

A spraying schedule is appended for Indiana in controlling these diseases.
A. B.

Apple, Internal Structure of. By E. J. Kraus (*U.S.A. Exp. Stn., Oregon, Bull.* 135, pp. 42; 31 plates).—A large number of apples were sectioned with a view to the study of internal characters for taxonomic and physiological investigation. Clearing and staining processes are described in detail. The bulk of the paper consists of photographs of the stained sections (transverse), which show very interesting differences in the pith areas, and disposition of vascular bundles. Well worthy of study by the systematic pomologist.—*E. A. Bd.*

Apple-Rot Fungi, Temperature Relations of. By C. Brooks and J. S. Cooley (*Jour. Agr. Res.* viii. pp. 139–163, Jan. 1917; figs.).—The temperature relations of the following fungi which cause rot of apples were studied: *Alternaria* sp., *Aspergillus niger*, *Glomerella cingulata*, *Botrytis cinerea*, *Sphaeropsis Malorum*, *Fusarium radicicola*, *Penicillium expansum*, *Sclerotinia cinerea*, and *Cephalothecium roseum*, *Mucor stolonifer*, *Neofabraea malicorticis*, *Volutella fructi*, especially in relation to cold storage. When fruit was placed in cold storage immediately after inoculation rot was either greatly delayed (least with *Sphaeropsis Malorum* and *Sclerotinia cinerea*) or completely stopped. When inoculation was attempted by washing the apples in spore suspensions very rarely was infection secured, pointing to the need for avoidance of punctures and other injuries to fruits to be held in storage.—*F. J. C.*

Apple Scab Fungus (*Venturia inaequalis*), **Ascospore Discharge of the.** By Leroy Childs (*U.S. Agr. Exp. Stn., Oregon, Bull.* 143, 11 pp., May 1917).—The author found that ascospores are ejected as early as March 20 at Hood River, and at Corvallis, Oregon, on February 25, and this discharge continues up to June 27 at Hood River, and up to May 20 at Corvallis. This early discharge of ascospores of *Venturia inaequalis* suggests to the author that early spring spraying is essential, and he believes that if an annual study is made to determine the earliest period of ejection of the ascospores throughout the country, recommendations as to the date of spring spraying could be issued and so prevent much loss by this fungus in apple-growing districts.—*A. B.*

Apple-spot Diseases, Irrigation Experiments on. By C. Brooks and D. F. Fisher (*Jour. Agr. Res.* xii. pp. 109–137, Jan. 1918; plates).—Bitter-pit and Jonathan spot are the troubles dealt with in the main. Bitter-pit was increased by heavy irrigation, but more so by heavy irrigation following medium irrigation. Light irrigation greatly reduced the disease, but at the same time greatly reduced the size of the apples. As is to be expected, large apples showed more disease than small ones, and the conditions conducing to growth also apparently induced the development of bitter-pit. Jonathan spot, a spot disease affecting at first the colour cells only, developed more on apples picked early than on those picked late, but the contrast was less in the later than in the earlier stages of storage. Spots due to aphis attacks, drought spot, cork, and blister are all discussed briefly and characterized.—*F. J. C.*

Apple Stocks, Investigations on. By B. T. P. Barker and C. T. Spinks *Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—An introduction deals with the importance of distinguishing the characteristics of apple stocks in any experimental work upon the trees. A tentative classification of free stocks based mainly upon their root systems is then given. The difficulties of propagating these free stocks have not yet been entirely overcome, but stool-layering appears to be the most promising method. Whether under different soil conditions the root systems of the different stocks will remain true to type remains to be seen.
F. J. C.

Apple, Xylaria Root-rot of. By F. A. Wolf and R. O. Cromwell (*Jour. Agr. Res.* ix. pp. 269–276, May 1917; figs.).—The authors attribute root-rot of apples to the attacks of species of *Xylaria*. Inoculation of the fungus into apple roots led to decay, but the extent of the decay varied in different roots to a considerable extent.—*F. J. C.*

Apples and Pears: Gathering and Storing the Fruit. By E. A. Bunyard (*Gard.* Oct. 6, 1917, p. 422).—The author recommends wrapping each fruit in paper and packing in boxes, such as Tate sugar boxes, which can be placed anywhere protected from the rain. A frost-proof building is not absolutely necessary; if frozen and allowed to thaw gradually the fruit will be none the worse. In gathering the fruit the general rule is to gather when the fruit parts easily from the tree. This does not apply to early varieties, which should be gathered before they come away easily, and they will then ripen slowly indoors. If allowed to ripen on the tree they become poor in flavour, mealy fruit rotting at the core.

Pears especially should be gathered with great care; a flat basket padded at the bottom and filled with only one layer of fruit should be carried by hand into the store.

Late fruits should be left on the tree as long as possible. Early gathering will mean shrivelled fruit. E. M. Hadow (Oct. 20, 1917, p. 442) confirms Mr. Bunyard's observation, that frost will not hurt apples allowed to thaw gradually under cover.—*H. R. D.*

Apples, Comparative Cooking Quality of Oregon. By A. B. Milam and H. B. Gardner (*U.S.A. Exp. Stn., Oregon, Bull.* 124; Feb. 1915; plates).—Many common varieties were cooked in a variety of ways and judged by points. The authors conclude that different varieties must be used for different specific purposes to obtain the best results. Size of fruit makes little difference in cooking quality of apples for sauce, and sauce-making preserves the flavour better than jelly-making. For sauce, apples in their prime or somewhat over mature are best. Good dessert apples are not necessarily the best for cooking. Apples belonging to the same pomological groups have similar cooking qualities. The sauce-making qualities of an apple vary inversely with the proportion of pith and vascular tissue and the cell cohesion and directly as the size of the cell.
F. J. C.

Apples, Drouth-Spot and Cork in. By A. J. Mix (*U.S.A. Exp. Stn., New York, Bull.* 426, pp. 471–522, Oct. 1916; 12 plates).—Two little-known apple diseases are found in Champlain Valley, New York State. They are non-parasitic in nature, and closely related to the fruit-pit or stippen disease. The names "Cork" and "Drouth-Spot" are suggested for them. Cork is evident in late June as dead brown spots beneath the skin of the fruit and around the core. The fruit is normal externally. Later the fruit becomes distorted and knobby, and brown corky areas are found scattered throughout the flesh.

Drouth-Spot occurs in early June, and depends upon the weather for its development. Sunken, irregular, dead brown spots show in the skin of the fruit, and dead brown areas are seen beneath. In the later stages, the apples become cracked and deformed.

These diseases appear in the best types of soil and in young healthy trees. The only control is the conservation of soil moisture and an equal distribution of moisture throughout the season.—*A. B.*

Apples: Variation during the Growing Season. By W. E. Whitehouse (*U.S.A. Exp. Stn., Oregon, Bull.* 134).—This investigation sets out to answer the question, "When does an apple make its growth?" It is found, as in other plants, a steady growth without a check depends on an adequate supply of water during the whole season. There is a tendency for the fruit to increase in transverse diameter later in the season. This we have often noticed in such varieties as King of the Pippins, which in a favourable year becomes much more oblate, that is, it makes its height first and then proceeds to increase its girth. Colour is deposited mostly just before gathering.

There is nothing particularly new in the conclusions, but it is interesting to see for once the gardeners' conclusions verified by careful scientific measurement.
E. A. Bd.

Arsenate of Lead Pastes, Effect of Freezing. By R. A. Datcher (*Jour. Econ. Entom.* 9, p. 561, Dec. 1916; figs.).—The author found the physical condition of arsenate of lead pastes was often altered by freezing, so that it was extremely difficult to work them up into a finely divided state for spraying. The powder was not so affected.—*F. J. C.*

Arsenical Injury through the Bark of Fruit Trees. By D. B. Swingle and H. E. Morris (*Jour. Agr. Res.* viii. p. 283; Feb. 19, 1917; figs.).—An investigation of alleged damage to the trunks of trees by spraying with arsenic compounds was carried out by the authors, who found the intact periderm of the smooth bark of the apple impervious to arsenical solutions. If arsenical solutions find their way through the bark during the growing season more or less injury follows, and this may occur through wounds, lenticels, or latent buds, while in older trees arsenical solutions may find their way into the inner tissues through cracks or fissures in the bark. Roots are similarly liable to injury. If the injury follows entrance through a wound, definite longitudinal streaks will be produced in bark and sapwood, but where the entrance is gained through the stem, such streaks are rarely to be seen. Painting wounds is only a partial protection. Calcium arsenite is the most injurious of the arsenical compounds used in spraying.—*F. J. C.*

Artanema longifolium Natke. By S. A. Skan (*Bot. Mag.* t. 8687; Nov. 1916).—*Scrophulariaceae* (*Gratioleae*). Native of Tropical Asia and Tropical Africa. A herb of which the lanceolate leaves are used in Lagos as a vegetable; of erect habit, and bearing racemes of dark purple flowers.—*F. J. C.*

Artichoke, Jerusalem. By M. E. (*Gard. Chron.* May 4, 1918, p. 183).—Deals with the names of this vegetable, and decides that Topinambour was a corruption of Toupinamboux, a name given by the French to some natives of the Isle of Maragnon, Brazil, in 1613, the only connexion between the two being an approximately simultaneous introduction to France. Girasole is here given as the origin of the appellation Jerusalem.—*E. A. B.*

Asparagus, Rhizoctonia Disease of. By B. T. P. Barker and C. T. Gimingham (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—Soil treatment against the attacks of *Rhizoctonia violacea* var. *Asparagi* upon the roots of Asparagus were carried out with promising results; complicated, however, by the fact that the host plant occupies the soil for several years.—*F. J. C.*

Astragalus. By H. Blin (*Le Jard.* vol. xxxi. p. 175; 1 fig.).—The roasted seeds of *Astragalus galegiformis* may be used as a substitute for chicory for mixing with coffee. Equal quantities of coffee and Astragalus form a good mixture.—*S. E. W.*

Bacterial Blight of Barley. By L. R. Jones, A. G. Johnson, and C. S. Reddy (*Jour. Agr. Res.* vol. xi. No. 12, pp. 635–644; 4 plates).—The authors find that bacterial blight of barley is very widespread and causes considerable loss. The causal organism is a monotrichous rod, yellow in culture, and has been named *Bacterium translucens* n.sp., and assigned the number 211·2222532 in the Chart of American Bacteria. Inoculation experiments show that the disease is readily induced on barley by spraying with water containing this organism. It, however, does not appear to attack oats, rye, wheat, or timothy.

The organism obtains an entrance through the stomata and passes along the intercellular spaces, producing small water-soaked areas which form yellow to brownish translucent blotches. Similar lesions may appear later upon the glumes, but the chief injury is apparently on the foliage. Soon an exudate appears as cloudy drops which harden into yellow resinous granules, or spread over to form grey flaky films. This exudate and translucent appearance of the lesions are the characteristics of this disease, and distinguish it from the Helminthosporium disease.

The bacterium attacks the chief types of barley; that is, 2 row, 6-row, and erect 6-row varieties, though there is a considerable range of varietal susceptibility to the disease.

Control measures have yet to be worked out, but seed disinfection and avoidance of attacked seed are suggested.

A short bibliography is appended.—*A. B.*

Beans, Sclerotinia Blight of. By J. A. McClintock (*U.S.A. Exp. Stn., Virginia, Bull.* 20, pp. 417–428, July 1916; 3 figs.).—In the autumn of 1915 a disease causing blight in beans (*Phaseolus vulgaris*) was observed in Tidewater, Virginia. The disease developed after a few days of hot damp weather and attacked stems, leaves, and pods. The fungus isolated was found to be the same as that which causes blight in lettuces; and reproduced by conidia and sclerotia, which can winter for some considerable time in the soil. Experiments with five varieties of beans demonstrated that Bountiful Stringless Green-Pod Wax, Celestial Golden Wax, and Extra Early Black Valentine were more resistant to the *Sclerotinia Libertiana* (Fckl.) than the Extra Early Red Valentine and Extra Early Refugee.

Burning the diseased plants, and deep ploughing, and suitable rotation are suggested as control measures.

Sclerotinia Libertiana can attack lettuce, cucumbers, egg-plants, as well as beans.—*A. B.*

Belladonna, Some Effects of Selection on the Production of, Alkaloids in. By A. F. Sievers (*U.S.A. Dep. Agr., Bull.* 306, Oct. 15, 1915).—Earlier investigations have established that a wide range of variation exists in the alkaloid content of belladonna plants. Results of further experiments are given to show that first-generation plants from seed of cross-pollinated selected individuals display the characteristic of the maternal parent with regard to alkaloid productivity. This was generally true at all the localities where the experiments were carried on, but there was a considerable difference in the general quantity of alkaloids produced at the different stations. Nothing definite, however, developed to

indicate that a relationship exists between the amount of precipitation and sunshine and the percentage of alkaloids produced.

Plants grown from cuttings tend to show the same characteristics regarding alkaloid production as the plants from which they were propagated and the original parent of those plants.—*M. L. H.*

Bibio johannis L., Larval and Pupal Stages. By Hubert M. Morris, M.Sc. (*Ann. Appl. Biol.* vol. iv. No. 3, Dec. 1917, pp. 91–114; plates).—The morphology of the larva, its habits, food, &c., and the economic significance of the Bibionidae. There appears to be some uncertainty about its destruction of roots of cultivated plants, but various species are recorded as attacking roots of oats, grass, lettuces, cabbages, and flowers in the seedling stage. *Bibio marci* is reported to have attacked tomatos, potatos, hop, and certain young tree roots. They are considered to have been introduced in leaf-mould or manure. *Bibio hortulanus* has damaged sugar-beet, spring barley, and wheat, many fields of the latter needing re-sowing. Larvae of *Bibio abbreviatus* are reported to have destroyed the soft tissues between the fibro-vascular bundles of celery stalks. The adults of *B. marci* are believed by one observer to have damaged fruit blossom, but some doubt is thrown upon it.

The larvae seem commonly to be found in cow-dung and other organic manure. They live near or at the soil level among roots of pasture grasses, within ½ inch of the surface and usually lying closely together in small colonies. Vaporite and injections of carbon bisulphide have proved useful against them. Domestic poultry, rooks, starlings, and chaffinches devour them readily. Spraying infected land with nitrate of soda solution in early spring, and harrowing in autumn or early spring after spreading quicklime, are recommended for field treatment. Deep ploughing and rolling at time of pupation have given satisfactory results. Contact poisons have not been effective, but trapping by burying old roots in the soil for digging up in March, and dressings of soot and lime, have proved useful.—*R. C. S. R.*

Blackberries, Cultivated, Native. By J. C. Varty Smith (*Gard.* Oct. 13, 1917, p. 431).—The first and most important point is to procure canes of only those varieties that are most productive and with largest fruits, as well as early and vigorous in growth. The question is asked why we do not cultivate our native blackberries. They will be found to give greater satisfaction than many American varieties, especially in the north. A little liberal attention in manuring increases the production, as well as the size of the fruits; and they can be left to ripen instead of being gathered when half ripe, as is often the case in positions where they are another's property.

Some hundreds of varieties of wild blackberries exist in the British Isles. Many are too rare as well as useless for the purpose. They should be selected when in fruit, and marked for removal to the garden in autumn or early spring.

Rubus Kolleri possesses all the good qualities necessary. When once a few canes are planted they can be extended by burying the tips of the long shoots in the soil, when they soon root. All the old wood should be cut out in February or March, the new shoots arranged where they can obtain equal light and sunshine, and a top dressing with manure provided.

On p. 478 Mr. James Britten points out that the true name of the above variety is *Rubus Koehleri.*—*H. R. D.*

Blackberry Culture. By George M. Darrow (*U.S.A. Dep. Agr., Farm. Bull.* 643, Jan. 29, 1915; figs.).—The cultivation of named varieties of the blackberry in America was started about 1850, and since that time at least 140 different named varieties have been introduced. According to the reports of the 1910 census there were 49,004 acres devoted to the cultivation of blackberries and dewberries in the United States in 1909.

A table in this bulletin shows the distribution of this acreage by States. It also contains information on choice of situation, soil, propagation, pollination, planting, fertilizing, and systems of training. A descriptive list of varieties is given.—*M. L. H.*

Black Currant, Big-Bud Mite. By A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton,* 1917).—Reports partial success in spraying against big-bud, but followed by wholesale infection in the succeeding year.—*F. J. C.*

Black Currants, "Reversion" in. By A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton,* 1917).—The author expresses the opinion that the so-called reversion is the result of injury to the terminal bud. A further paper is promised.

F. J. C.

Brassicas, Clubbing in. By Clarence Ponting (*Gard.* Dec. 15, 1917, p. 541).—Dr. Potter having suggested in vol. 42 of the R.H.S. JOURNAL that the spores of Plasmodiophora are killed or rendered inoperative below a depth of 4 or 5 inches, the author records a successful experiment of planting some rather leggy plants of cottagers' kale with a dibber quite 6 inches below the surface in infested ground.—*H. R. D.*

Calcium Compounds in Soils. By E. C. Shorey, W. H. Fry, and W. Hazen (*Jour. Agr. Res.* viii. pp. 57–78, Jan. 1917).—Sixty-three samples of soil were examined for calcium compounds, viz. carbonate, sulphate, humus compounds, and in easily and difficultly decomposable silicates, and a wide variation in total calcium and in content of calcium carbon and the two classes of silicates was found. In twenty-nine cases calcium in combination with humus compounds was found to be absent. Five samples were acid to litmus and were characterized by poor drainage. It seems probable that soils rich in total calcium, but poor in calcium carbonate, may be better suited for some crops than soils with high calcium carbonate content.—*F. J. C.*

Callicarpa Giraldiana Hesse. By O. Stapf (*Bot. Mag.* t. 8682).—*Verbenaceae* (*Viticeae*). A hardy shrub of easy culture. Six feet in height. Leaves, elliptic lanceolate, 3–5 inches long. Flowers small, in subglobose panicles, whitish. Fruits, for which the plant is most worth growing, lilac. One of the most beautiful of recently introduced fruiting shrubs. Native of W. Szechwan through Hupeh to Shensi.—*F. J. C.*

Capsid Bug of Apple: Control by Spraying. By F. H. Petherbridge (*Jour. Bd. Agr.* vol. xxiv. No. 12; March 1918).—An illustrated article showing damage done to apples, especially certain varieties, such as 'Lady Hollendale,' 'Early Victoria,' 'Grenadier,' and 'Lord Grosvenor.' It was found that the bug (*Plesiocoris rugicollis*) could be controlled by spraying with a soft soap and nicotine spray. The best time for spraying is said to be ten days after the first marking of the leaves by Capsids, as then most or all of the Capsids will have hatched. Growers who are able to spray twice should do so in the case of a bad attack, once before blossoming and again just after blossoming. The amount of soap used varies with the hardness of the water, 10 lb. per 100 gallons being sufficient for soft water, while amount of nicotine should be from 7 to 8 oz. to the 100 gallons of water.—*G. C. G.*

Carnations, The Use of Commercial Fertilizers in Growing. By H. B. Dorner, F. H. Mencie, and A. H. Fehrling (*U.S.A. Exp. Stn. Ill., Bull.* 176).—Commercial fertilizers are equally as good as farmyard manure for this crop.

Both dried blood and sulphate ammonia were used as sources of nitrogen, and when combined with acid phosphates and sulphate of potash produced flowers both in quantity and quality equal to the best results obtained from stable manure.

An excess of nitrogenous fertilizer or sulphate of potash proved disastrous to the crop, destroying a whole stand of blooms in a few weeks. On the other hand, a large dose of acid phosphates, 2¾ lb. per 100 square feet of bench once a week, both improved quality and quantity of the blooms on the particular plot treated.—*C. P. C.*

Cauliflower, Ring-spot of. By A. V. Osman and P. J. Anderson (*Phytopathology*, v., pp. 260–265; figs.).—A destructive leaf spot of cauliflower is described due to the same fungus as attacks cabbages in England (see JOURNAL R.H.S. xl., p. 76) (*Mycosphaerella brassicicola*). No control measures are reported.—*F. J. C.*

Cedars, A Nursery Blight of. By G. G. Hahn, C. Hartley, and R. G. Pierce (*Jour. Agr. Res.* x. pp. 533–539; Sept. 1917; plates).—*Juniperus virginiana* has been attacked by a fungus in the nursery beds, but rarely when over four years old, and large numbers of plants have been killed. The diseased plants appear as though killed by drought. A species of *Phoma* has been found which is capable of acting as a wound parasite, not only on *J. virginiana* but also on *J. barbadensis*, *J. pachyphlaea*, *J. communis*, *J. communis sibirica*, *J. prostrata*, *Thuya occidentalis* and *T. orientalis*, and *Cupressus glabra*.—*F. J. C.*

Cedar Rust Fungi. By J. L. Weimer (*U.S.A. Exp. Stn., Cornell, Bull.* 390, May 1917; figs.).—The fungi described in this paper have as hosts on the one hand species of Juniper, especially *Juniperus virginiana*, and in their aecidium stage various Rosaceae. Economic loss amounting to many thousand dollars

annually is reported from certain States, especially where apple and juniper are growing in close proximity. *Gymnosporangium Juniperi-virginianae*, *G. globosum*, and *G. clavipes* are the species dealt with.—*F. J. C.*

Chenopodium, A Desirable Vegetable. By E. Meunissier (*Rev. Hort.* vol. xc. pp. 15–17).—*Chenopodium purpurascens*, *amaranticolor*, and *album* are of easy culture. Sow on a hot bed about the middle of April and prick out ten days later. It is not particular as to soil, and does not run to seed in hot weather. It is superior to spinach in flavour.—*S. E. W.*

Christmas Tree Plantations. By A. K. Chittenden (*U.S.A. Exp. Stn., Michigan*, 1916).—To determine the practicability of growing Christmas trees as a farm crop, an experimental plantation was established in 1909. Sufficient time has now elapsed to warrant definite conclusions being drawn from this plantation.

Four-year-old Norway spruce transplants were used. These trees were about 1·4 feet high, good, strong, sturdy stock. They were planted with a triangular spacing of 3 feet, at the rate of 5,584 to the acre. The marking was done with a horse marker.

For Christmas tree purposes too rapid growth is not desirable. If the trees grow faster than one foot a year they become spindly. The best Christmas trees are those that grow rather slowly. They are bushier and better shaped than very rapidly grown trees.—*A. D. W.*

Cichorium Intybus, Fertility in; Self-compatibility and Self-incompatibility among Offspring of Self-fertile Lines of Descent. By A. B. Stout (*Jour. Genetics*, vol. vii. pp. 71–104, Feb. 1918; plates).—The author shows that sterility develops in chicory independently of anatomical incompatibility or embryo abortion, such as occurs through malnutrition of embryos. The degree of self-compatibility appears to vary, and selection for self-fertility after two generations was not effective in producing a completely self-fertile strain. Both phenomena occur in both cross-bred and in-bred races.—*F. J. C.*

Cider Apple Jelly, the Manufacture of, Cider Industry in Relation to Present-Day Food Problems. By B. T. P. Barker (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—The utilization of apples and pears generally made into cider for food purposes (jam and fruit pulp, jelly, syrup, and culinary purposes), the avoidance of losses that usually occur in dealing with the cider fruits, and the improvement of grass orchards are dealt with in these papers, which should be consulted.
F. J. C.

Cider Vinegar. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—To make cider vinegar the acetic ferment (*Bacterium xylinum*) (which is present in all unpasteurized samples) must be present, air must have free access to the cider, and it must be kept at a temperature of 65°–85° F. Fermentation may be started by the addition of a little good vinegar to cider in a wooden cask, which is placed on its side, has a hole of about 1 inch diameter at each end and a funnel with a rubber tube dipping into the cider through the bunghole. The funnel and the holes should be covered with fine gauze.—*F. J. C.*

Ciders, Single Variety. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—The chemical composition &c. of various ciders made in 1916–17 is given.
F. J. C.

Citrus Fruits, A New Machine for Peeling. By S. C. Hood (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 399, Dec. 16, 1916, pp. 13–19; 5 figs.).—By the use of this machine, one man can in one hour remove the peel from 2 tons of oranges or from 3½ tons of grape fruit. The peel comes from the machine in a finely divided condition suitable for the extraction of the oil, and the peeled fruit is delivered in a condition suitable for use in the manufacture of various food products. A full description of the machine and its working is given.—*F. G. A.*

Citrus "Mottle-leaf": The Mulched-basin System of Irrigation and its Bearing on the Control of. By L. J. Briggs, C. A. Jensen, and J. W. McLane (*U.S.A. Dep., Agr., Bur. Pl. Ind., Bull.* 499, Feb. 12, 1917, 31 pp.; 1 plate, 12 tables).—In a previous paper (dealt with in these Abstracts, vol. xlii. p. 486), the authors showed that mottle-leaf of citrus trees was apparently associated with a deficiency of organic matter in the soil, and perhaps also inadequate irrigation. Further experiments made in a commercial orange-grove in California now indicate that the furrow system of irrigation and intensive surface cultivation may be in part

responsible. The present paper deals with a new method of citrus cultivation, which the authors call the mulched-basin system. Low dikes are thrown up so as to form large shallow irrigation basins near each tree, and each basin is heavily mulched with lucerne hay, bean straw, manure, or some other organic material. The basin makes it possible to supply each tree with water according to need, while the water carries plant food from the mulch to the roots of the trees.

The mulched-basin system was found to conserve the soil moisture better than any other system tested, and none of the basined trees on either light or heavy soils wilted. Under all the other cultural methods employed, wilting occurred at some period during the summer.

Circular trenches dug around orange trees, filled with manure or alfalfa and covered with dirt, did not remain sufficiently open after the second irrigation to distribute the irrigation water adequately.

For a basin having an area of 150 square feet, the experiments indicate that approximately 150 lb. of alfalfa or 15 to 20 cubic feet of stable manure will be required each year to maintain an effective mulch.

The new leaves on the basined trees were less mottled, larger, and darker in colour, and the new growth of rootlets was very much greater.

No soil crust of any kind has been found in the basins where the mulch completely covered the soil surface.

The experiments indicate that lucerne and bean straw are superior to stable manure for mulching purposes.

The use of an organic mulch moderates the rise in soil temperature during the day.—*F. G. A.*

Clematis afoliata J. Buch. By T. A. Sprague (*Bot. Mag.* t. 8686; Nov. 1916).—A curious species with leaflets suppressed and only petioles developed. A native of New Zealand, it flowered on a sunny wall at Warley Place, and is probably hardy only in the warmer parts of the British Isles. Its whitish flowers are about 1½ inch in diameter, and apparently freely produced.—*F. J. C.*

Clematis Armandi. By E. A. Bowles (*Gard.* Dec. 1, 1917, p. 519).—This is one of a century of certificated plants (1914) introduced from China by Dr. E. H. Wilson.

It is one of the most distinct hardy climbing plants by reason of its handsome leaves, which were not hurt by the winter 1916–17. It is evergreen and almost as handsome in mid-winter as in mid-summer, and only more beautiful then from the contrast between the dark olive-green of the old growths which set off the rich yellow-green of the young. It does not show its true beauty until it is allowed to produce hanging growths of three seasons.

Evergreen climbers are rare, and except Ivies look rather woebegone in March, when this Clematis pushes along its flower-buds, developing emerald-green bracts among its oldest and most sombre leaves. The flowers appear in April, the earliest rather small and greenish, but in a spell of warm weather they make a good show, those at the end of the month being almost white and of good size. The seeds ripen in July, and look like pale-green spiders with long hairy white legs, and before they have fallen there is a second blossoming.—*H. R. D.*

Clubroot of Cruciferous Plants, Studies on. By C. Chupp (*U.S.A. Exp. Stn., Cornell, Bull.* 387; March 1917; plates).—The author finds that neither the wind nor the power of locomotion possessed by the swarm-spores of *Plasmodiophora Brassicae* are of importance in disseminating the fungus. He was able to germinate spores and carry out infections which point to the fact that bacteria so frequently found in the "clubs" are not necessary to the subsistence of the fungus, but merely invade the tissues of the host after the rupture of the host cells. The fungus is able to penetrate cell walls, and infects the host through the root hairs. Another organism, apparently *Olpidium Brassicae,* is frequently present in the infected roots. It causes no hypertrophy.—*F. J. C.*

Codling Moth in Maine, Life History of the. By E. H. Siegler and F. L. Simanton (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 252, Aug. 10, 1915, 50 pp.; 9 figs., 41 tables).—The life-history studies recorded were conducted during the seasons of 1913 and 1914. The codling moth in Maine may be controlled with one spray thoroughly applied as soon as the petals drop. Arsenate of lead paste 2 lb., or powder 1 lb., to each 50 gallons of water, is recommended.—*F. G. A.*

Codling Moth Trap. By E. H. Siegler (*Jour. Econ. Entom.* 9, pp. 517–520, Dec. 1916; fig.).—A trap for codling moths is figured. It is said to have been used with great effect, and is a modification of the autumn hayband method of dealing with the pest.—*F. J. C.*

Coleosporium ribicola, Aecial Stage of. By W. H. Long (*Mycologia*, viii. No. 6, p. 309, Nov. 1916).—A Peridermium was found on needles of *Pinus edulis* in New Mexico. Spores inoculated on *Ribes leptanthum* produced the typical *Coleosporium ribicola*. Spores from this produced the same on *R. longifolium*. In addition to these, the fungus has been found on *R. Grossularia, R. inebrians, R. pumilum, R. Purpusii, R. valicola,* and *R. mescalerium.—F. J. C.*

Cranberries, End Rot of. By C. L. Shear (*Jour. Agr. Res.* vol. xi. No. 2, pp. 35–41; 1 plate).—The author states that the end rot disease of the Cranberry (*Oxycoccus macrocarpus*) is caused by a fungus hitherto not described. It is found throughout the United States, and attacked particularly the variety 'Late Howe.' The disease may start at the blossom or stem end of the berry, and causes complete decay of the fruit. In culture media only the pycnidia have been obtained. A characteristic series of colours in the mycelium and pycnidia are formed when grown upon stems of *Melilotus alba* in culture conditions. Spraying with Bordeaux mixture usually effectively controls this disease. The author has given the name *Fusicoccum putrefaciens* n.sp. to this fungus.—*A. B.*

Cranberry, False Blossom of. By C. L. Shear (*U.S.A. Dep. Agr., Bull.* 444, pp. 8; 4 plates).—A malformation of the flower of the Cranberry causes considerable losses in Wisconsin plantations and elsewhere. No cause can be assigned save a lack of nutritive balance; better cultivation offers the only remedy.—*E. A. Bd.*

Cranberry Rootworm. By H. B. Scammell (*U.S.A. Dep. Agr., Bull.* 263, pp. 8; 2 plates).—*Rhabdopterus picipes* does much damage in New Jersey to Cranberry bushes by feeding on the roots of the plants. Remedial measures have not been discovered, but invigorating the plants by sand and fertilizers is recommended.—*E. A. Bd.*

Crocus chrysanthus, Warley Variety. By G. A. Bowles (*Gard.* p. 100, March 24, 1917).—*Crocus chrysanthus* is the most variable in colour of the species. It was first known in its plain rich yellow form. Maw found (i) forms with bronzed or feathered outer segments, golden within, which he named; (ii) white forms with golden throat (var. *albidus*); (iii) white flowers outwardly suffused with lilac (var. *caerulescens*). The author had raised several generations of the latter, some of which appeared to be reverting to the yellow type when he received some bulbs from Hoog of Haarlem. These proved to *C. chrysanthus*, and it was thought some of its seedlings might give yellow forms, which proved to be the case at Haarlem. The flowers from the bulbs were shown by Miss Willmot, February 14, 1905, and received an A.M. under the name Warley variety. They are soft creamy yellow with rich orange throat and scarlet stigmata, and flower in February.—*H. R. D.*

Currants, A Revision of the Red. By E. A. Bunyard (*Gard. Chron.* Nov. 24, Dec. 1, 8, and 15, with 9 figs.).—Shows there are five main groups descended from three distinct species. *Ribes vulgare*, with distinct fleshy ring around pistil. *R. rubrum*, with no fleshy ring. *R. petraeum*, with claret-red flowers and red shoots.

The groups are arranged thus:—

I. Raby Castle Group.—Soft downy leaves, derived from *R. rubrum pubescens*.

II. Versailles Group.—Short stems easily broken. Descendants of a large form of *R. vulgare* known as *macrocarpum*.

III. Goudouin Group.—Stout wood, coriaceous leaves, red flowers, form of *R. petraeum*.

IV. Scotch Group.—Stiff upward folding foliage. Bell-shaped flowers tinged with red. Show descent from *R. rubrum*.

V. Dutch Group.—Large light-green leaves. Flower of *vulgare* type.

E. A. Bd.

Cyclamen Mite. By G. F. Moznette (*Jour. Agr. Res.* x. pp. 373–390; Aug. 1917; figs.).—*Tarsonemus pallidus*, a species allied to the Begonia mite of our own greenhouses, has done great damage to Cyclamen in America. It also attacks Chrysanthemums and Antirrhinums. The attack is generally upon leaves just unfolding, causing distortion and frequently thickening in the portions adjacent to the damaged areas. Flower buds are also attacked, and discoloration of the flowers follows. Blotching and streaking of the flowers and their rapid death are the common symptoms in this part of the plant. The mites, which are very small, difficult to discover, and hide in parts of the plant away from the light, are described and figured. Various methods of control have

been tried. Fumigation is useless. Spraying with a nicotine compound gave the best results. [The soft soap and sulphur dip which has proved so useful with begonia mite in England does not appear to have been tried. It is made by kneading flowers of sulphur into a handful of soft soap and dissolving the mixture in 1½ gallon of water.]—*F. J. C.*

Cymbidium ensifolium. By J. Gattefosse (*Le Jard.* vol. xxxii. pp. 245, 246; 1 fig.).—*Cymbidium ensifolium* is grown in large quantities in China, where it is regarded as the queen of flowers. The orchid is grown in basin-shaped pots under glass with a minimum temperature of 50° F. A light soil containing peat mixed with half its bulk of powdered shell and plenty of water is desirable. A solution of 100 grammes of ammonium phosphate, 60 nitrate, 10 carbonate, and 8 grammes of potassium nitrate makes an excellent fertilizer.—*S. E. W.*

Cytisus monspessulanus Linn. By O. Stapf (*Bot. Mag.* t. 8685; Nov. 1916).—Shrub 3 to 9 feet high, native of Mediterranean region and Canaries. Introduced before 1735. Killed by 15°–20° of frost, but seeds easily obtained from South France. Flowers bright yellow in clusters in May.—*F. J. C.*

Dahlia 'Suzanne Lebret.' By F. Cayeux (*Rev. Hort.* vol. xc. p. 10; 1 col. plate).—'Suzanne Lebret' forms a bush about one yard in height. It bears numerous flowers of a delicate tint, which are intermediate between the Cactus and the decorative dahlias. The flowers are slightly incurved at the centre and recurved at the periphery.—*S. E. W.*

Dendrobium Palpebrae Lindl. By R. A. Rolfe (*Bot. Mag.* t. 8683; October 1916).—Native of Burma, and first introduced by Messrs. Veitch from Moulmein in 1849. Flowers white, lip with yellow or orange disk and a markedly ciliate margin. Thriving in company with *D. thyrsiflorum* and *D. densiflorum.*
F. J. C.

Disanthus cercidifolia. By A. O. (*Irish Gard.* xiii., Jan. 1918, p. 6).—This comparatively little-known shrub is quite hardy out of doors. Well-drained loamy soil is desirable, containing leaf-mould and peat. It blooms in October.
E. T. E.

Dunes, Control of. By F. H. Sanford (*U.S.A. Exp. Stn., Michigan,* May 1916).—Vast amounts of money have been spent on sand dune reclamation, some to good purpose followed by entire success, and some in the form of experiment. This experimental work has demonstrated satisfactorily the possibility of control. Dunes which occur near salt water present greater difficulties in their control than those lying inland or near fresh water. The humidity of the locality as well as the total annual and seasonal rainfall all contribute their effects. The Great Lakes sand dunes are favoured in this respect. The lake winds are heavily charged with water and the annual rainfall amounts to from thirty-five to forty inches on the Lake Michigan shore and from twenty-six to thirty inches on the Huron and Superior shores. Under such moisture conditions, and with the absence of the deleterous influence of the salt spray of other regions, successful reclamation of shifting sand may be assured.

Beach grass, known also as Sea Sand Reed, Sea Matweed, and Marram, *Ammophila arenaria* (L.) Link. is the most valuable grass known to hold drifting sand. It is found along all the shores of the Great Lakes and grows vigorously. It is particularly valuable because of its root-stalk growth, which enables it to grow up through rapidly accumulating sand.

Sand along the Michigan shores can be controlled if proper methods are applied. Certain plants are admirably adapted for use in establishing a "crust" in which other forms of tree growth must be planted to insure permanent forest cover.

By waiting for planted belts to grow into high shelters, certain adjacent belts in the lee may be utilized by the growth of certain forest crops, or orchards, but never by annual crops.

Studies of planting done from ten to twenty years ago point out the imperative need of establishing and maintaining a solid cover on the windward slopes of all dunes.

Planting must begin there so as to establish a facing of low forms that are capable of withstanding the rough treatment to which they will be subjected.

In all dune formations where the sand is cast up by water a control shelter of hardy shrubs must be set as close as possible to the winter line of high water and ice. An artificial barrier of drift material and wood forms a splendid protection and justifies expense to establish it.—*A. D. W.*

Dusting and Spraying Nursery Stock. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Bull.* 385, January 1916; figs.).—The application of a dry mixture of 90 parts sulphur (passing 200-mesh sieve) with 10 parts arsenate of lead to horse-chestnut, currant, plum, cherry, quince, and rose trees in the nursery kept leaf diseases in check. The method was rather more expensive than spraying with liquid sprays, but it is claimed was quicker and more thorough. The greatest importance is attached to fine grinding.—*F. J. C.*

Echiums, Frutescent. By D. Bois (*Rev. Hort.* vol. lxxxix. pp. 346–347, 376–378; 3 figs.).—On account of its resistance to cold, *Echium Wildpretii* is most suitable for cultivation in Europe. *E. violaceum*, *E. candicans*, and *E. Pininana* approach it in hardiness. Those varieties which only possess one flower-stalk die after flowering, but certain hybrids produce several flower-stalks and flower for several years; for example, *E. simplex* × *candicans*, and *simplex* × *Decaisnei*.—*S. E. W.*

Eucomis Pole-Evansii. By N. E. Brown (*Gard. Chron.*, May 4, 1918, p. 185; with fig. and Latin diagnosis).—This new species, found in the Transvaal, produces flower-stems 5 to 6 feet high and is nearest akin to *E. pallidiflora.*—*E. A. B.*

Farm Manures. By J. C. Beavers (*U.S.A. Exp. Stn. Purdue, Cir.* 49, March 1915).—A treatise on the composition, conservation, and general treatment of farmyard manures. The author recommends concrete pits for storage, and the addition of some form of phosphates as aids to the conservation of the fertilizing values of such manures.—*C. P. C.*

Farmyard Manure, Changes taking Place in the Storage of. By E. J. Russell and E. H. Richards (*Jour. Agr. Sci.* vol. viii. part 4, Dec. 1917, pp. 495–563; fig. 9, tables 10).—It is well known that there is a serious loss of nitrogen in the cultivation of land rich in organic matter. At Rothamsted about one-third of the nitrogen added to the soil is recovered in the crop, a certain amount is stored in the soil, and some passes away in the drainage water. Only a little more, however, than 50 per cent. is thus accounted for, and it is difficult to avoid the conclusion that some escapes in the gaseous state. The authors are investigating the general problem, and the present paper deals with one section of it only, namely, the conditions under which the changes in farmyard manure in bulk occur and the character and amount of the changes under varying conditions. Experimental work was conducted both in the laboratory and on heaps. It is found that if manure is stored under strictly anaerobic conditions and at a temperature of about 26° C., the nitrogen is converted into ammonia and there is no loss of nitrogen. On the other hand, the laboratory experiments show that with complete aeration there is also no loss of nitrogen. Neither of these two ideal and opposite conditions are possible of attainment in practice, however; but we can approximate to the former by leaving the manure under the beasts in boxes or covered yards until it is wanted, or by storing the manure in water-tight tanks or pits which can be kept closed. The worst method of keeping manure is to allow it to be exposed to rain and air in loosely compacted heaps.—*J. E. W. E. H.*

Flax Wilt. By W. H. Tisdale (*Jour. Agr. Res.* No. 11, vol. xi. Dec. 1917, pp. 573–606; 3 plates).—This disease is highly destructive to common flax (*Linum usitatissimum*), and frequently causes the loss of the entire crop. The causal organism is *Fusarium lini*, which enters the flax plants by means of the root hairs, stomata, or wounds in epidermal surfaces. The fungus invades the various tissues of the plant, and finally wilting takes place. Wilting may be due to the combined action of several factors: (*a*) Destruction of root system; (*b*) use of food and water supply of the plant by the fungus; (*c*) vigorous growth of fungus; (*d*) possible formation of toxins by fungus. Resistance to Wilt fungus is an inheritable character, which is determined by multiple factors; considerable variation in the plants of a strain with regard to resistance is seen in their offspring. Even North Dakota Resistant No. 114 (the best strain) is not entirely resistant with the high summer temperatures in the greenhouse.

Various experiments are described in the production of semi-resistant varieties. A short bibliography is appended.—*A. B.*

Flowering Plants of January. By B. (*Irish Gard.* xiii., Feb. 1918, pp. 18–20; 2 figs.).—The writer gives a list of over a dozen such plants, with interesting particulars about them. These include various species of Ericas, Irises, Prunus, Rhododendron &c., as well as *Lonicera fragrantissima*, *Chimonanthus fragrans*, Hellebores, Clematis, and Galanthus.—*E. T. E.*

Flowers of February. Anon. (*Irish Gard.* xiii., March 1918, pp. 38–39).—An interesting article describing a number of flowers blooming in February.—*E. T. E.*

Flowers of March. By J. W. B. (*Irish Gard.* xiii., April 1918, pp. 53–54).—Dealing with the more important flowers blooming during that month.—*E. T. E.*

Flowers of April. By J. W. B. (*Irish Gard.* xiii., May 1918, pp. 70–72).—Dealing with shrubs and plants in bloom during April.—*E. T. E.*

Flowers of May. Anon. (*Irish Gard.* xiii., June 1918, pp. 86–88).—Possibly the article is not intended to cover all the more common May-blooming flowers, for we cannot find in it any mention of Doronicums, *Lupinus polyphyllus* and several other plants which usually bloom from the middle to the end of May. *E. T. E.*

Fruit Blossom Bacillus. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton,* 1917).—The organism which has been isolated from fruit blossoms was found in the soil, and especially about the roots of various plants. It is suggested that it possibly aids growth in some way, for germination in sterilized soil was much more rapid where the soil had been inoculated with the bacillus than in its absence.—*F. J. C.*

Fruit Buds, The Freezing of. By F. L. West and N. E. Edlefsen (*U.S.A. Exp. Stn., Utah,* Feb. 1917).—When plant tissue freezes, water passes out of the cells and ice forms in the intercellular spaces. It has been found that if the thawing is done slowly enough when working with tender plants, such as lettuce and matured fruits, the water will gradually pass back into the cells, and if the original freezing did not rupture the cell wall, the plant has suffered little harm from the ice formation. If, however, the thawing is done rapidly, the water does not get back into the cells and they die through drying out. We must have then either a rupturing of the cell wall when the ice is formed or else ice formation and in many cases rapid thawing in order to kill the tissue.

Summary.—1. Many Utah orchards are poorly located from the standpoint of topography and its relation to frost.

2. Some of these orchards are paying good returns, although frost occasionally destroys the crop.

3. In many States, loss from frost has been avoided by artificially heating the orchards.—*A. D. W.*

Fruit Crop and Fruit Prospects (Ireland), 1917. By W. S. Irving (*Irish Gard.* xii., Aug. 1917, pp. 120–122).—The first two pages consist of a table of reports from a very large number of Irish districts by different gardeners, &c. These reports cover all the more important classes of hardy fruit. The last page is taken up with an account of the Irish 1917 Fruit Crop.—*E. T. E.*

Fruit Industry. Anon. (*Irish Gard.* xiii., April 1918, p. 54).—Brief notes on the important matter of the Irish Fruit Industry.—*E. T. E.*

Fungus Fairy Rings in Colorado and their Effect upon Vegetation. By H. L. Shantz and R. L. Piemeisel (*Jour. Agr. Res.* xi. Oct. 1917, pp. 191–245; 20 plates).—A large number of fungi have been shown to produce "fairy rings," those characteristic circles of vegetation which so commonly occur in meadows and fields. The authors deal only with those fleshy fungi which produce these rings in Western Colorado, and find that *Agaricus tabularis* is largely concerned in their formation. This fungus produces an enormous number of spores, and their germination and growth as mycelium cause the fairy rings to develop. The ring starts from the point of germination of the fungus spore and spreads outward at approximately an equal rate in all directions. Where an obstacle—ant-hill or another ring—is encountered, growth stops at this point. The effect of the fungus hyphæ on the soil is to reduce a part of the organic matter to ammonia, which may be converted by bacteria into nitrites and then nitrates. This increase in available nitrogen in the soil stimulates the growth of the grasses and other plants, which therefore make a greater demand on the soil moisture. When this is once exhausted (in *A. tabularis*) the mass of fungus hyphæ prevent the penetration of rain water. The drought produced kills off the various grasses, and so the area becomes bare. After some time the mycelium of the fungus dies and leaves the soil further enriched and pervious to water. The first stage in the succession on this bare area is (1) an early-weed stage followed by (2) a late-weed stage. Then comes (3) a short-lived grass stage, followed by (4) a perennial stage, which is succeeded by (5) the original short-grass covering.

A full bibliography is given at the conclusion of the paper.—*A. B.*

Forest Management in New York State, Possibilities of Private. By Cedric H. Guise (*U.S.A. Exp. Stn., Cornell*, April 1916).—Within the boundaries of the State of New York some 34,000,000 acres are included, of which 12,000,000 acres are in woodland. The bulk of State-owned land lies within the Adirondack and Catskill preserves. These preserves are situated in parts of sixteen counties, consist of nearly seven thousand scattered parcels, are bounded by almost nine thousand miles of line, and are intermixed with over three times as large an area of private forest land. This private property is controlled by corporations, private clubs, associations, and individuals.

At the present time a bulk of forestry work in New York is carried on almost entirely by the State Government. In a few cases private estates have their own foresters, but generally such work is carried on in co-operation with the State Forest Service. The work of the Conservation Commission was primarily for State lands, but private owners can derive great benefit from its efforts.

Reforestation work has steadily progressed. The State supplies at cost to private parties, trees for planting, and each succeeding year shows an increased number of trees shipped from the State nurseries. Since 1908, when the State first began this work, 14,624,000 trees have been supplied for reforestation.—*A. D. W.*

Forest Planting in New York State, Reforesting Methods and Results of. By B. H. Paul (*U.S.A. Exp. Stn., Cornell*, April 1916).—The majority of the plantations in the State are comparatively young. Very little reforesting was done prior to the year 1899, when the New York State College of Forestry at Cornell University made its first forest plantation at Axton, in the Adirondacks. Since 1899 planting has been done on State lands nearly every year, and up to the present time a total of over 7,000 acres has been reforested within the Adirondack and Catskill forest preserves.

In 1908 the State began supplying trees to individuals at cost, and from these sales about 15,000 acres of privately owned lands have been reforested. In addition, 3,000 acres of State land have been reforested at various State institutes, and between 5,000 and 6,000 acres have been privately reforested with trees purchased from commercial dealers or grown in private nurseries.

Plantations established prior to 1899 with imported nursery stock or by sowing tree seeds are to be found at Mill-brook and at White Lake Corners. The age of these plantations ranges from eighteen to forty-four years; the present yields are given on pages 679 and 687 of this bulletin.

Two men working together by the hole method can plant, on an average, from one thousand to twelve hundred trees in a day. On sandy soils with very little sod or grass, as many as fourteen hundred have been planted by two men in one day. On very stony soils, or where there is a heavy sod, the rate of planting is relatively lower. The average cost of planting should not exceed six dollars an acre under favourable conditions. The total cost of establishing a plantation, inc uding cost of trees, freight, and labour, varies from seven to twelve dollars an acre.—*A. D. W.*

Forestry (*Quart. Jour. Forestry*, Jan., Apr., July 1917).—Spring frosts occur chiefly in moist situations, and in hollows or valleys. In the former the great evaporation of the soil moisture makes the nights cold, and in the latter the evaporation produces heavy cold layers of air, which there are no winds to blow away. This cold air hangs close to the ground, and often trees 10 feet in height or more can be seen with their lower leaves up to 5 feet or so all withered, and the higher ones untouched. Frosts again are very prevalent in sandy soils, which, although easily heated in the daytime, cool rapidly at night. A thick growth of grassy weeds also increases the danger from frosts by increasing the radiation of heat and consequent cooling of the surrounding air.

Among broad-leaved trees, beech, ash, sweet chestnut, and oak are very sensitive to frost, while sycamore and elm do not suffer very severely. Alder, birch, hornbeam, and most of the poplars are decidedly frost-hardy. Of the conifers, larch, spruce, silver fir, and the Oregon Douglas fir are very susceptible to frost; while Scots fir and Corsican and Austrian pines are hardy.

Timber Control.—It is officially announced that as the problems connected with the supply of timber have now only an indirect connection with the War Office, the War Cabinet have decided to transfer the Timber Supply Department from the War Office to the Board of Trade.

As the result of investigations, it appears that Douglas fir may be planted with confidence on soils overlying chalk, provided the top 12 inches or so is thoroughly disintegrated, and especially if the previous crop of hardwoods or underwood has left the surface rich in humus. The Douglas fir has

proved itself so valuable for the production of large masses of high-class timber in this country, that many think it should have a preference over most other trees for planting under any conditions which hold out a reasonable prospect of success. Hitherto planters have been dissuaded from the using of Douglas fir unless the soil to a depth of 4 to 5 feet was fairly free of lime, but, with the experience of this investigation no hesitation need be felt in forming plantations, even where solid chalk occurs within 2 feet of the surface, and where abundant lumps of chalk are met with even at a less depth.

Bog-land, or any land with a predisposition to slip and slide, may be fixed by draining and planting with those species having stoloniferous and binding root systems. Norway spruce is an excellent "drainer" in localities suited to it. On peats the Sitka spruce (*Picea sitchensis*) has been tried with success, notably in Scotland, and other trees which may be planted in such situations with prospects of success are *Pinus Pinaster* and Scots and Weymouth Pines. Alder will grow where there is the requisite moisture.

It is very unusual for the pine beetle to be found attacking the shoots of larch, or any conifer but the pine, and especially the Scots pine, but it is not unknown. The explanation that Mr. McLaren offers is no doubt the correct one. Alongside the larch plantation, on an adjoining estate, the wood of Scots pines was felled during the past spring, and the timber was left lying on the ground for some months. Here was ample opportunity for the pine beetle to breed in large numbers. About the month of August the young broods would appear, and in the ordinary course would have sought the leading shoots, or the shoots of side branches, of Scots pines, and have bored into them. As a matter of fact, Mr. McLaren reports that the few Scots pines mixed with the larch have had every shoot excavated, but these not sufficing to supply the food required by swarms of insects, the latter have been driven to attack a plant, namely, the larch, which under ordinary circumstances they leave alone.

On most well-managed estates there is some system in vogue for extending the life of the timber used in estate buildings and for fencing and other purposes. There are several methods used for this end, such as impregnating with naphthalene or painting with solignum, &c., but the most common one is that of creosoting with heavy creosote oil. There are three ways of creosoting: (1) By pressure—the most effective; (2) by immersing the timber in the liquid and boiling for some hours; (3) by simple cold immersion. The last is the slowest process of all and the least effective, for the creosote cannot penetrate to any extent, although, as it is very cheap, it may with advantage be used on farms and very small estates, where the expense of a more elaborate system would not be justified. The boiling method is the most commonly used on estates, for the cost of the steeping tank and heating apparatus is far less than that of the large air-tight cylinder and powerful pumps necessary for creosoting under pressure. It affords very good results with many species of timber, but in others there is not the thorough saturation of the outer tissues as in creosoting under pressure. The latter is the most effective method in use, although, incidentally, it is the most expensive *at the time*.

At the present time and for the past few years one of the most striking features in the district comprising North Bedfordshire and Huntingdonshire, from an arboricultural point of view, is the prevalence of diseased and unsightly ash timber, both hedgerow and otherwise. A sound and well-grown ash tree is now, comparatively speaking, a rarity in this part of the country, where ash is by no means scarce, practically all now standing being badly shaped trees past their prime, or leggy saplings in the spinnies.

Canker and malformations are woefully numerous, the damage being effected by *Nectria ditissima*, frost, bark-gnawing, and accidental wounds, or sometimes, in the case of hedgerow trees, from bark-scorching. Either of the last-mentioned calamities not infrequently seems to have been subsequently aggravated by the fungus named. The Goat Moth (*Cossus ligniperda*) has claimed an astonishing number of victims, and its larvæ have done widespread damage, for the ash appears to be their favourite host in this part of the country. It has also been observed with interest that the Green Woodpecker, though active, has confined its attacks solely to diseased or decayed trees.—*A. D. W.*

Forestry (*Trans. Roy. Scot. Arbor. Soc.*, Jan., July 1917).—The country has been informed that it is the intention of the Government to make every available acre of land productive. This can only be done with the aid of afforestation. There are, no doubt, thousands of acres of agricultural land, now neglected, which are capable of being profitably cultivated. But beyond these, there are millions of acres of waste land capable of being profitably planted,

Unless the Government will assist in planting them, one of the greatest natural resources of the country must remain undeveloped.

The benefits of national afforestation may be summarized as follows :—

1. It would turn many barren wastes into profitable woodlands.
2. It would retain, in the rural districts, thousands of men who now have to seek employment in the towns.
3. It would keep in this country, for the benefit of the country, millions of pounds now paid away to foreigners.
4. It would enable a large number of small holdings to be established on economic lines.
5. It would lead to the development of many new industries.
6. It would ensure such a supply of timber as would enable British industries to be carried on, without curtailment and without anxiety, in the event of another great war.

From a variety of reasons, conifers have become more and more the principal forest trees in temperate climates. As this tendency is likely to increase in the immediate future, it is becoming increasingly necessary that the diseases of coniferous trees should be understood. The Chermesidae are all enemies of coniferous trees, namely, spruce, larch, pine, silver fir, and in America, Douglas fir. The damage done by these pests is largely dependent on the vigour of the hosts. Thus, when the environment of the conifers is ideal, the damage done by the Chermes is not important, but the biological adaptations of the Chermesidae are such that the slightest diminution in the health of the trees means that these pests become serious enemies.

The most important matter connected with the rearing of plantations undoubtedly lies in the selection of suitable species for the margins, together with their after-management. Unless this important matter is carried out on sound principles, it is hopeless to expect any plantation to reach maturity and produce the best commercial timber. In fact, the whole life of the plantation, till it reaches maturity, may be said to be entirely dependent on the stability of the margins.

A great deal has been written on the varieties of trees which should be grown and the best methods of treatment; but seldom, if ever, has any reference been made to the formation and management of margins. Both in theory and in practice do we find that margins have been neglected. The trees forming these are generally the same species as are found in the interior of the plantation, and, what is often worse, the treatment meted out to them is often the reverse of what is required to train a substantial wind-screen.

It is generally found that the practice has been to thin the interior and leave the marginal trees close together, especially in exposed situations, in order that they may break the blast and give shelter to the interior. Under this treatment the trees become drawn-up, tall and slender, the side branches are destroyed, the trees become stunted in growth and covered with lichens, there is no room for root development, and, instead of forming a barrier to the wind, they are themselves laid low.

The lack of a good margin allows the wind to have full play underneath, so that the forest floor is swept clean for a considerable distance. The soil is thus robbed of that important part of a forest soil—a humus layer.

One of the outcomes of the war may be the recognition by the British mining industry of the possibility of its demands for pit-props being met by the use of home-grown timber. It would therefore appear desirable for producers to consider whether they can meet such a demand and the best method of maintaining a supply.

In the past practically the only marketable product of British woodlands has been mature timber. This means a rotation of at least sixty years, so that no individual lives to market the crop he has planted—a fact which has greatly retarded afforestation. While mature timber will still be in demand, and in all probability maintain its value, it seems quite possible by careful selection of site and genus to grow a crop of pit-wood which will give a good return in fifteen to eighteen years. The advantage of a short rotation to the grower is so obvious that no comment is needed, and its advantage to the nation by reducing payments to other countries for foreign wood is equally apparent.

It is believed that there are at least four different trees which can be grown in Britain that will give a crop of pit-wood in fifteen to eighteen years.

The study of the diseases incidental to coniferous seedlings, while of great interest to the plant pathologist, may be of the greatest practical value to the nurseryman and forester, especially when not only the cause is ascertained, but

when an appropriate remedy, and better still a means of prevention, can be suggested.

Fungi claim many victims in a close-grown spruce crop. For example, *Trametes radiciperda* seems to attack the healthiest and best-developed specimens. This fungus is always present in the plantations, and sporophores are freely produced in burrows, and on the sides of open drains. The spruce needle-rust (*Chrysomyxa Abietis*) is found in different localities here, but seems confined to old mature trees or stunted suppressed specimens. Alongside one of these mature infected spruces a small area was planted two years ago with five different species of Picea, but as yet no signs of susceptibility to this fungus have been shown. *Lophodermium macrosporum* is somewhat virulent on the needles of a pure spruce crop of thirty-eight years of age. The foliage of individual trees becomes quite red, and on shaking the tree the needles fall in showers to the ground. On many of the spruce needles the conspicuous black perithecia are present. A part of this wood was felled for pit-wood, and this disease was alarmingly prevalent. It had been the direct cause of the death of many flourishing trees.—*A. D. W.*

Foxglove, A Smooth-stemmed Form of the. By Miss E. R. Saunders (*Jour. Genetics*, vol. vii. pp. 215–228, May 1918).—Two forms of the common foxglove are known, both breeding true, the one with hairy grey stems, the other with green polished stems, pubescent only among the flowers. The latter form (***nudicaulis***) is dominant when crossed with the former (***pubescens***), and segregates in a 3 : 1 ratio in F. The glabrous form is thus probably the original, and the pubescent one has probably mutated from it. The rare occurrence of thickened sepal margins with structures resembling rudimentary ovules is noted, and peloria and heptandry are noted as inherited independently and both recessive to the normal.—*F. J. C.*

Fragaria, A Further Note on the Genetics of. By C. W. Richardson (*Jour. Genetics*, vol. vii. pp. 167–170; May 1918).—Pink-flowered ***Fragaria vesca*** × white-flowered gave pink-flowered; these selfed produced 20 pink, 57 pale pink, 10 white (including 3 quite white) or nearly so. Double × single (both ways) gave singles segregated in about 3 : 1 ratio in F_2. Hairy stems and front of leaf appeared in F_1 *virginiana* × *chiloensis*, and in F_2 segregated into a 3 to 1 ratio. A few figures with regard to sex inheritance are also given.—*F. J. C.*

Garden, The Home, in the South. By H. C. Thompson (*U.S.A. Dep. Agr., Farm. Bull.* 647, March 20, 1915; plates).—A plea for more widespread cultivation of green food for their families by the cotton-growing community, for reasons of health, pleasure, and even of profit. It contains a body of information for the inexperienced on vegetable-growing, and gives a descriptive list of the vegetables most suitable and likely to succeed under the local conditions.—*M. L. H.*

Gipsy Moth in America, Food Plants of the. By F. H. Mosher (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 250, July 24, 1915; 39 pp., 6 plates).—Describes laboratory experiments and field observations for the purpose of ascertaining what species of trees and shrubs are preferred as food by the gipsy moth. The trees and shrubs tested have been arranged in four classes, according to their susceptibility to attack. Among forest trees, oaks and birches predominate over much of the area infested, and these are specially susceptible. Among the horticultural crops most likely to be affected is the apple. In moderate infestations, arsenate of lead (10 lb. to 100 gallons of water) is recommended, applied as soon as the trees come into full leaf.—*F. G. A.*

Gipsy Moth Work in New England. By A. F. Burgess (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 204, May 21, 1915, 32 pp.; 5 plates, 6 maps, 3 figs., 5 tables).—Field work, consisting of application of hand methods for controlling these insects, as well as inspection of plant products from the infested area, is to some extent preventing the spread of the gipsy moth, but, on account of the enormous area infested, it is impossible to cover much of the woodland. Experimental work, including introduction of parasites and natural enemies, together with careful studies of the food plants and other factors, has helped materially in decreasing the amount of infestation, and will probably become more potent in the future. The importance of bringing forest lands into a growth which is unfavourable to the development of the gipsy moth cannot be too strongly urged.—*F. G. A.*

Gladiolus, Hard Rot Disease of. By L. M. Massey (*U.S.A. Exp. Stn., Cornell, Bull.* 380; Sept. 1916; figs.).—The first symptoms of this disease are minute brown or purplish-brown circular spots on foliage usually in July or

August, finally becoming almost black. The older spots are limited by the veins. On the corms the spots are at first minute, usually on the lower, but sometimes also on the upper part of the corm, and seen only after removing the tunics. Later the centre of the spot becomes sunken, the tissue black, and the margin more definite. There is a distinct hardening of the tissues, so that they are difficult to cut with a knife. Plants grown from diseased corms are more or less stunted, often fail to flower, and quickly lose their leaves, which turn brown and die. The author found the fungus *Septoria Gladioli* Passer always associated with the disease, carried out inoculation experiments, and gives drawings of fungus and diseased tissues. Crop rotation, the planting of healthy corms only, and the destruction of diseased foliage and corms are the measures recommended.
F. J. C.

Hop Resistant to Mildew, On Forms of the. By E. S. Salmon (*Jour. Agr. Sci.* vol. viii. part 4, Dec. 1917, pp. 455–460).—The author has observed that two seedling hop plants raised from seed of the wild *Humulus Lupulus* procured from Italy were not attacked by Mildew (*Spaerotheca Humuli*) when exposed with several hundred one- and two-year-old seedling hops under conditions extremely favourable to Mildew. All the other seedlings were infected. Subsequently a similar immunity was observed in the case of seven out of about one hundred and sixty seedlings, also raised from Italian seed of the wild plants and grown under conditions very favourable to Mildew. *Humulus Lupulus* in the wild state therefore comprises forms which may be either very susceptible or very resistant to attack by *S. Humuli*. Whether these forms are morphologically identical or not has not yet been determined. It may be that they are "biologic forms," such as have been observed among plants of *Spiraea Ulmaria, Epilobium montanum, Ranunculus repens*, &c.—*J. E. W. E. H.*

Huntleya citrina Rolfe (*Bot. Mag.* t. 8689; Dec. 1916).—*Orchidaceae* (*Vandeae*). A plant from the collection of the late Sir Trevor Lawrence, native of Colombia. An epiphytic species with numerous pale-green distichous leaves 6 to 11 inches long. The solitary flowers are axillary, pale yellow, with a blood-red crest to the lip, and borne on pedicels about 2 inches long.—*F. J. C.*

Insect Metabolism, the Influence of Atmospheric Humidity on, Some Facts relative to. By Thos. J. Headlee, Ph.D. (*Jour. Econ. Entom.* x., pp. 31–38; Feb. 1917).—The author opens his paper by stating some known cases of the influence of atmospheric humidity on various stages of insect development; and goes on to give a detailed account of some experiments carried out with the bean weevil (*Bruchus obtectus* Say.), and the Angoumois grain moth (*Sitotroga cerealella* Oliv.). It is shown that air in which the humidity is kept low by H_2SO_4 may be so dry as to prevent the bean weevil from carrying out its life history or even entering the seed. A reference is given to a native method in Rhodesia of protecting maize from weevils by mixing it with finely powdered wood ashes, and it is also noted that a layer of wood ashes on the outside of the sack alone is effective. A layer of building lime on the floor of the storing place and between successive layers of bags gives satisfactory results; and it is suggested that whilst one would naturally attribute the results to the caustic effect of the ashes or lime, the fact that protection is secured, even when the substances are not in direct contact with the seed, may be due to the well-known hygroscopic properties of ashes and lime. The author suspects that here we have the practical application of the effect of low relative humidity.—*G. W. G.*

Insecticide, Quassia Extract as a Contact. By N. E. McIndoo and A. F. Sievers (*Jour. Agr. Res.* x. pp. 497–531; Sept. 1917).—A long paper detailing a large number of experiments and concluding that in general quassia extracts are not efficient insecticides, although solutions may be made which are effective against certain species of aphis.—*F. J. C.*

Irises of June, The Garden. By G. Dillistone (*Gard.* July 21, 1917, p. 286).—This article contains a useful review of Garden Irises flowering in June, particularly of some of the new varieties.—*H. R. D.*

Juniperus Cedrus. By G. V. Perez (*Jour. Soc. Nat. d'Hort. France*, Jan. 1917).—An account of the cultivation of this rare native of the Canaries.—*F. J. C.*

Kelp, Potash from. By K. Cameron (*U.S.A. Dep. Agr., Bur. of Soils, Bull.* 100; 40 plates, 33 tables).—A comprehensive description of the kelp beds of the United States, the method of harvesting from same, and the preparation of potash salts with the residue of valuable by-products.

Some idea of the value of this work may be obtained from the heading of one of the tables, comprising such items as Latitude, Longitude, Kind, Density of Bed, Size, Area, Tonnage, Nearest Shipping Points, Anchorage and Shelter. One of the sections in Western Alaska is estimated to produce 80,300 tons of potassium chloride.—*C. P. C.*

Kerria japonica, A Twig and Leaf Disease of. By V. B. Stewart (*Phytopathology*, vii. pp. 399–407, Dec. 1917; figs.).—Small discolored areas of a reddish-brown colour are produced on leaves which later become yellow, shrivel, and fall prematurely. Similar spots occur on the shoots, and frequently the bark dries up on these spots and falls away, sometimes to such an extent that the twig is girdled. The fungus involved appears to be a new species which is described as *Coccomyces Kerriae*.—*F. J. C.*

Lagenaria oleifera. By R. de Noter (*Le Jard.* vol. xxxi. pp. 190, 191; 1 fig.).—It is proposed to cultivate this gourd as a source of oil. With plenty of manure and water it would succeed in the south of France or Algeria. Each gourd weighs about 50 lb. and is full of seeds, from which the oil is expressed; 12 lb. of oil are obtained from each gourd. The residue forms a valuable food for cattle.—*S. E. W.*

Lemon-grass Oil, Possibility of Commercial Production of, in the United States. By S. C. Hood (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 442, Jan. 25, 1917, 12 pp.; 3 figs., 6 tables).—A volatile oil distilled from *Cymbopogon citratus* DC., commonly called lemon-grass, used in the perfume and soap industries. The climatic requirements are subtropical; it is chiefly produced in India and Ceylon. Experiments have been made in Central Florida, and it is believed that the crop would yield favourably if grown in connexion with other volatile-oil plants. With lemon-grass alone, the distilling plant would be in use during only a few weeks in the year. The bulletin gives details of culture, distillation, &c. *F. G. A.*

Lilies in July. By J. W. B. (*Irish Gard.* xii., Aug. 1917, p. 126).—Interesting notes on Lilies blooming in the month of July.—*E. T. E.*

Lilium Parkmanni. By P. S. Hayward (*Gard.* Sept. 1, 1917, p. 359; fig.).—Well-nigh half a century ago Mr. Parkman, an American, raised *L. Parkmanni*, a grand hybrid between *L. auratum* and *L. speciosum*, and it is a pity such a noble plant should be lost.

This season the author flowered the new hybrid, which is a successor to *L. Parkmanni* between *L. speciosum* and *L. auratum*. It carries the size of *L. auratum platyphyllum* and its fragrance with the finest *L. speciosum* colouring. The seed was sown in 1914, and from present appearances it gives the impression of a first-class constitution.

The editor appends a note of the history of *L. Parkmanni*.—*H. R. D.*

Lilium pseudo-tigrinum. Anon. (*Irish Gard.* xii., Oct. 1917, p. 150).—A very desirable new Chinese species.—*E. T. E.*

Lime as an Insecticide. By Z. P. Metcalf (*Jour. Econ. Entom.* x., pp. 74–78; Feb. 1917).—This paper gives an account of experiments carried out for the purpose of finding a control for the pea and bean weevils (*Bruchus chinensis* Linn. and *B. quadrimaculatus* Fabr.). Carbon-bisulphide in large doses, paraffin, and crude carbolic acid did not give at all satisfactory results; but the use of air-slaked lime was successful.

The article is accompanied by plates illustrating cow-peas untreated and treated with various quantities of lime. Farmers are advised to store their seed peas in air-slaked lime at the rate of one part lime to two parts peas by weight, until something cheaper can be found. It is not necessary thoroughly to incorporate the lime with the seed in order to secure protection. In these experiments it was simply poured over the seed previous to bagging (see Abstract on Insect Metabolism).—*G. W. G.*

Lime Sulphur Solution. By A. A. Ramsay (*Agr. Gaz. N.S.W.* vol. xxix. pp. 210–211).—There is an essential difference between lime sulphur and self-boiled lime sulphur solutions. Only a small proportion of lime and sulphur enter into chemical combination in the self-boiled solution, and the chief product of the reaction is calcium thiosulphate, which has small fungicidal value. The sulphur in suspension is probably the active ingredient. In the lime sulphur solution, 91 per cent. of the lime and sulphur go into solution. Most of the sulphur is present as polysulphide.—*S. E. W.*

Limestone Tester, A. By C. G. Hopkins (*U.S.A. Exp. Stn., Ill., Cir.* 185, Feb. 1916).—It describes a simple apparatus for testing the purity of the various limestone rocks, much used as ground limestone for improving soils.

A table is printed showing the weight of carbon dioxide at various temperatures and barometer readings to be used in calculating the amount of calcium carbonate present in tested sample.—*C. P. C.*

Locust in Cyprus, The. By W. P. D. Stebbing, F.G.S. (*Ann. Appl. Biol.* vol. iv. No. 3, Dec. 1917, pp. 119–122).—Describes the methods since the British occupation in 1878 of combating the locust ravages in Cyprus. Before that date no attempts were made to solve the problem of preventing attacks. Among the most useful natural enemies are birds and lizards. The successful methods are: 1. Egg-collecting by digging up the egg-masses, always laid in light soil bordering fields. 2. Stopping the crawling larval hosts by trenches, on the further side of which were screens topped with strips of American cloth. They were unable to surmount this obstacle and fell back into the trench, to be suffocated by the oncoming larvae. 3. Sprinkling feeding areas with a bacteria cultivation, causing an outbreak of epidemic disease among them.—*R. C. S. R.*

Maize, Varieties of. By H. Wenholz (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 635–644, and 685–693; 13 figs.).—The following varieties of maize are officially recommended for cultivation in New South Wales: 'Leaming,' 'Yellow Dent,' Reid's 'Yellow Dent,' Funk's 'Yellow Dent,' 'Early Yellow Dent,' 'Red Hogan,' 'Boone County White,' 'Hickory King,' 'Silver Mine,' and 'Early Clarence.' The illustrations show the general growth, and the ears of the different varieties.—*S. E. W.*

Mealy-Bugs, Methods for the Study of. By G. F. Ferris (*Jour. Econ. Entom.* x., pp. 321–325; June 1917).—The author criticizes the use of the so-called antennal formulæ (i.e. the relative lengths of the segments of the antennæ) and the supplementary characters usually given—as totally inadequate and in fact misleading as specific criteria. He then details a means of staining specimens in order to accentuate characters that are said to be of essential importance. The specimens to be prepared are boiled in caustic potash in the usual manner and then removed, and the bodies washed out in clear water. They are next transferred to a one-half or a one-third strength magenta-red solution and left six hours. Finally the excess stain is removed by washing in 95 per cent. alcohol and the specimens placed for an instant in carbol-xylene and mounted in balsam. The method is equally applicable to insects other than coccids and has been found eminently satisfactory for certain aphides, particularly *Chermes* and *Phylloxera*, and with the larvæ of Cecidomyidae.—*G. W. G.*

Meconopsis nepalensis var. **elata.** By B. (*Irish Gard.* xiii. p. 103, July 1918; 1 fig.).—A handsome plant bearing large clear yellow flowers. Height, 3–4 feet. Basal leaves up to 15 inches long of greyish appearance, due to yellowish down interspersed with long soft hairs. Anthers deep orange. Quite distinct from *M. paniculata*. Soil, moist peat, as for *M. Prattii*. Flowering period, June. *E. T. E.*

Meconopsis Prattii. (Anon.) (*Irish Gard.* xiii. p. 103, July 1918; 1 fig.).—A beautiful new Chinese species similar to *M. racemosa*. Flower scapes 2–3 feet high, flowers deep blue, basal leaves up to 1 foot long. White anthers; soil, moist peat. Flowering period, June.—*E. T. E.*

Melon 'Petit Nantais.' By Vivet (*Rev. Hort.* vol. xc. pp. 136–137; 1 col. plate).—The Melon 'Petit Nantais' is a hardy plant resulting from crossing 'Orangine' with 'Petit Prescott.' It excels its parents in flavour and in the colour of its fruit.—*S. E. W.*

Melon Seeds (*Rev. Hort.* vol. xc. p. 110).—New melon seed yields vigorous plants with numerous male flowers and not many female. The plants raised from old seed are less vigorous and produce many female flowers.—*S. E. W.*

Mexican Apple. By E. N. Ward (*Agr. Gaz. N.S.W.* vol. xxix. pp. 134–136; 2 figs.).—The Mexican Apple (*Casimiroa edulis*) flowers in spring and autumn, bearing flowers, immature and ripe fruit on the same branch. The fruit is as large as a medium-sized apple with a stone like an almond. The flavour is delicious, and contrary to popular belief no ill-effects were produced by eating the fruit.—*S. E. W.*

Mottling, Composition of Citrus Leaves at Various Stages of. By C. A. Jensen (*Jour. Agr. Res.* ix. pp. 157–166; May 1917).—An examination of the chemical composition of mottled orange leaves, leading to the conclusion that the mottling is not due to deficiency in any of the chemical elements usually required by plants. (See also 'Citrus.')—*F. J. C.*

Myzus ribis (Linn.), **The Migratory Habits of.** By C. P. Gilette and L. C. Bragg (*Jour. Econ. Entom.* x., pp. 338–340; June 1917).—This is one of the best-known aphides. It occurs on various species of *Ribes*, more especially the common red currant. It has long been known that many of the aphides leave the currant bushes during the summer; and the authors state that they have repeatedly successfully transferred migrants from *Ribes* to *Stachys* and *Leonurus*, and the autumn migrants from these plants to the currant. They feel safe, therefore, in announcing these two genera, at least, as summer hosts of *Myzus ribis*. *G. W. G.*

Nicotine Sulphate, a Neglected Factor in the Use of. By W. Moore and S. A. Graham (*Jour. Agr. Res.* x. pp. 47–50, July 1917).—The authors report illness due to eating of lettuce sprayed twelve days before with a nicotine wash. Nicotine itself is very volatile and no harm will follow the use of plants sprayed with it twenty-four hours before, but nicotine sulphate is non-volatile and should not be used in spraying greenhouse plants which are to be eaten later. The lime, &c., in hard waters indirectly brings about the volatilization of nicotine from nicotine sulphate, and the authors recommend that washes containing nicotine sulphate should be made alkaline with soap, &c., before use.—*F. J. C.*

Nicotine Sulphate as a Poison for Insects. By A. L. Lovett (*Jour. Econ. Entom.* x., pp. 333–337; June 1917).—An account is given of some experiments with nicotine sulphate as a stomach poison for insects. Tent caterpillars (*Malacosoma pluvialis*) were placed on foliage sprayed with "Black Leaf, 40" 1–1200, after the leaves had dried. In this as in the other experiments the spray had an extremely nauseating effect on the caterpillars causing many of the larvæ to fall from the foliage and lie as dead for some hours, eventually recovering and crawling away. Where any feeding took place the larvæ were killed. The general conclusions reached are:—

1. Nicotine sulphate is a very powerful repellent to caterpillars.
2. Caterpillars will not ordinarily feed from choice on foliage sprayed with comparatively weak solutions; but when they do so, even small portions of leaves are sufficient to kill.

Nicotine sulphate as a contact insecticide is usually considered a very efficient but expensive spray. It is pointed out that, in view of the possibility of its wider insecticidal properties, this conception may yet be considerably modified.—*G. W. G.*

Onion. By A. F. Pearson (*Irish Gard.* xiii., Feb. 1918, pp. 29–30).—A useful cultural article.—*E. T. E.*

Onion Fly, Poisoned Bait Spray against. By H. H. P. Severin and H. C. Severin (*Jour. Econ. Entom.*, 8, pp. 342–350; June 1915).—The life-history of the well-known onion fly (*Phorbia cepetorum*) is detailed and an account given of its ravages. It is stated that seventy methods of control have been proposed, but that a poisoned bait spray has not been used. The authors experimented with a spray to be applied before the fly lays its eggs, composed of molasses ¼ pint, sodium arsenite (dissolved in boiling water) ¼ oz., water 1 gallon. They found the flies were attracted by this spray, which need therefore not be applied so as to cover the whole plant, but there is considerable danger of the material being washed off by spring rains and also of the foliage being burned, while invasions from neighbouring gardens would render the frequent repetition of the spraying necessary.—*F. J. C.*

Onion-growing. Is it worth while? By Douglas Newton (*Jour. Bd. Agr.* vol. xxix. No. 12; March 1918).—A five-page article giving facts and figures in connexion with onion-growing on a commercial scale. Figures given for 1915 crop show a loss, but in 1916 and 1917, owing to high prices of the crop, substantial profits were made, notwithstanding the high costs of cultivation. Brief notes on soil, previous crop, seed, labour, manuring, and storage are given, and the author concludes that owing to exigencies of shipping situation home-grown onions will pay for some years to come, as we are faced by a shortage of some millions of bushels of onions.—*G. C. G.*

Onions and Gherkins, Pickling (*Agr. Gaz. N.S.W.* vol. xxviii. p. 577).—To retain the white colour of onions when pickled proceed as follows. Pour hot water over the small onions to facilitate the removal of their skins. As they are skinned place them in strong brine. After twenty-four hours renew the brine and repeat this operation next day. On the following day put the onions in fresh water and heat them to the boiling point, stirring frequently. Milk added to the water helps to whiten the onions. Drain well, place the onions in a jar and pour boiling vinegar over them. No spices must be added, if the white colour is to be retained. To retain the green colour of gherkins, let 200 gherkins stand all night in water to which a pint of salt has been added. Drain off the water and replace by vinegar in which parsley has been steeped for some days. The vinegar is boiled with one ounce of cloves, one ounce of allspice, and a piece of alum the size of a walnut. The boiling vinegar is poured over the gherkins, and the pickles covered with green cabbage leaves. The addition of a few green peppers is a great improvement.—*S. E. W.*

Onions, Neck Rot Disease of. By M. T. Munn (*U.S.A. Exp. Stn. New York, Bull.* 437, pp. 363–455, July 1917; 11 plates).—This disease is commonly met with in the chief onion-growing districts of Michigan and New York States, and in many other districts where onions are stored. In the case of stored onions the disease appears as masses of sclerotia, black in colour, while in other cases the fungus forms a dense mass of grey mould. The causal organism is *Botrytis Allii*, and infection may take place through the bulbs and the leaves. The fungus produces an appreciable amount of oxalic acid and secretes the enzyme pectinase. This may be extracted, and from a study of its action it is possible to explain all the tissue changes which take place in the host.

The factors favourable to infection are immaturity and imperfect curing of the bulbs; mistakes in applying manures; humidity and heat in the storing-house. The methods of control lie mainly in field sanitation, and care of the stored crop in suitable houses at proper temperatures.—*A. B.*

Orange Oil from Waste Oranges. By S. C. Hood and G. A. Russell (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 399, Dec. 16, 1916, pp. 1–12; 5 figs., 5 tables).—Describes the method of extracting sweet-orange oil. The yield of pressed oil from 100 lb. of waste oranges is estimated at 4 to 5 oz., giving a net return of 32 to 44 cents.—*F. G. A.*

Orchard Costs and Methods. By C. G. Woodbury and others (*Agr. Exp. St., Purdue, Bull.* 194, pp. 77; 55 figs.).—Deals with all phases of the treatment of established orchards, with special reference to the profit side of these matters.
E. A. Bd.

Orchard Enemy, The Parandra Borer as an. By F. E. Brooks (*U.S.A. Dep. Agr. Bull.*, July 1915).—The most important means of preventing injury to trees by the Parandra borer is the keeping of the trees in such a condition of soundness that the beetles will not deposit eggs in them. The entrance of the borer into the tree is first made where dead wood is exposed by the removal or decay of bark following mechanical injury or disease. If the exposure of dead surfaces can be prevented, the danger of attacks from this borer will be eliminated. Injury to the trunks or larger branches of fruit trees, affording favourable places for borer attack, result from a variety of causes, some of which at least are easily preventable. The practice of leaving stubs six inches or more in length in pruning out large branches is quite likely to result ultimately in injury form this insect. The stubs left are practically sure to die back to the trunk and from a decayed spot or cavity that s exactly to the liking of the beetle as a place in which to oviposit. Instead of leaving such stubs when removing large branches, the cut should be made near to the trunk where the natural swell at the base of the branch will insure healing to be most rapid. The cut surface should then be covered with a heavy coat of white lead or some similar paint.

Whenever borers of this species gain entrance to a tree there is only one practical way of removing them, and that is to gouge or chisel out all the wood through wh ch their burrows extend. The cavity should then be properly cleaned and disinfected and filled with cement. Wherever the borers are present at all they are likely to occur in considerable numbers, and it is their habit in feeding to scatter about through the wood so much that little can be accomplished by attempting to remove them with a knife and wire, as is often done with some other species of fruit-tree borers.

In chiselling out the borers preparatory to using cement, all the punctured wood and all the wood soaked with water or affected by decay or disease should

be removed. The interior of the cavity should then be sterilized by applying creosote with a brush, after which it should be painted with a heavy coat of coal-tar. The cav ty should then be filled compactly with a mortar made of one part of a good grade of Portland cement and three parts of clean sharp sand.—*A. D. W.*

Orchids in the Open. By L. Cezard (*Rev. Hort.* vol. lxxxix. p. 360, and vol. xc. p. 34).—Orchids usually grown in temperate or cool houses may in many cases be grown out of doors if they are given a south aspect and protected from the wind by a wattle fence or screen of bamboos or young hornbeam. A light covering is necessary to guard against hailstorms. The following gave good results: *Epidendrum vitellinum, Cattleya Mossiae, C. Mendelii, C. Gaskelliana, C. Trianae.* They require plenty of light and a dry atmosphere. The temperature should not fall below 40° F. *C. intermedia, C. Harrisoniae,* resist damp better than the above. *Laelia anceps, L. autumnalis, L. praestans, L. cinnabarina, L. harpophylla* are less difficult to grow. *Dendrobium thyrsiflorum* and *D. Wardianum* require moist heat during their period of growth. *D. nobile* is less exigeant in this respect. *Vanda Amesiana, V. Kimballiana, V. tricolor* can be grown with the Cattleya and Dendrobium. *V. coerulea* is the most beautiful and flowers freely but cannot endure cold damp. *Coelogyne cristata* grows easily, but is uncertain in flowering. *Miltonia Clowesii, Odontoglossum grande, O. pulchellum, Oncidium incurvum, O. concolor, O. crispum, O. Marshallianum, O. leucochilum, O. Wentworthianum, O. Rodgersi, O. Sarcodes, Brassia verrucosa* are cultivated like the Cattleya but need more water. Most of the Cypripediums are of easy cultivation. They require a fibrous compost and protection from the direct rays of the sun. This also applies to *Anguloa Clowesii, Cymbidium Lowi, C. Tracyanum, Lycaste Skinneri, Sobralia macrantha,* and *Disa grandiflora.* The two last must have copious watering.—*S. E. W.*

Palms, Transplantation of. By A. R. Proschowsky (*Rev. Hort.* vol. xc. pp. 139, 140).—The method of transplantation, in which the trees are previously deprived of their roots and leaves, gave good results in the case of *Phoenix canariensis, Chaemaerops humilis, Washingtonia filifera,* and *W. robusta.*—*S. E. W.*

Parasite Eelworm on Potatos and Cotton. By N. A. Cobb (*Jour. Agr. Res.* vol. xi. No. 1, Oct. 1917, pp. 27–33; 5 figs.).—The author describes a new nematode parasite (*Tylenchus penetrans* n.sp.) which has been discovered infesting the tubers of the potato, the feeding roots of camphor, the root-stocks of violets, and the roots of cotton.

The external symptoms are the presence of spots or sunken areas upon the roots or tubers of the attacked plants; each area when fully developed contains a number (up to 50) of *T. penetrans* in various stages of growth. The disease has been found in widely separated districts under different climatic conditions and in widely diversified hosts, so that it appears reasonable to assume that this species of nematode can adapt itself to widely varying conditions. The presence of this nematode in potato is significant, and points to the great care necessary to plant healthy tubers only, if prevention of this disease is desired.—*A. B.*

Parsnip. By Andrew F. Pearson (*Irish Gard.* xiii., Jan. 1918, pp. 4–5).—A practical and valuable article on the entire culture of this vegetable, which has come to the front so much since 1914.—*E. T. E.*

Parsnips, Diseases of. By A. D. Cotton (*Kew Bull.* April 1918, pp. 8–21; figs.).—An account of the canker of parsnips is given, and the author concludes, as the result of experiments with manures and attempted infection, that it is not due to the attack of any specific organism. It is occasioned in the first place by cracking following rain after a period of drought. The parsnip cannot produce wound cork, and various pests find an easy entrance into the root and cause extensive damage. Several other diseases were met with in the course of the investigation, some of them being new to Britain, and including attacks of *Erysipe Polygoni, Phyllachora Pastinacae, Ramularia Pastinacae, Cercosporella Pastinacae,* and *Plasmopora nivea.*—*F. J. C.*

Peach Bacterial Spot in Southern States, The Control of. By John W. Roberts (*U.S. Dep. Agr., Bur. Pl. Ind., Bull.* 543, 1917, pp. 1–7).—The peach bacterial spot (*bacteriosis*), caused by *Bacterium pruni*, occurs in nearly all the peach-growing districts of the United States. It is particularly serious in the Southern States. The bacterium also causes a disease of the plum, Japanese varieties being chiefly affected.

All parts of the plants may be attacked, but the most serious injury is to the leaves.

The author suggests that the disease may be checked by proper pruning, cultivation, and fertilization. Nitrate of soda is particularly useful as a fertilizer. Trees in normal health and vigour are resistant to the disease.—*A. B.*

Peach, Improved Fructification. By H. Blin (*Le Jard.* vol. xxxii. p. 248).—An annular incision at the base of the branches of the Peach tree, immediately below the fruit, increases the weight of the crop, and advances the ripening of the fruit by at least a week. The incision is made when the trees begin to flower. The process succeeds in warm climates.—*S. E. W.*

Peanuts. By W. D. Kerle (*Agr. Gaz. N.S.W.* vol. xxix. pp. 137–142, 262–273, 338–343; 14 figs.).—The Peanut is an annual, thriving in districts which are suitable for maize. The crop is susceptible to frost, and should not be planted too early. One acre of ground should receive 88 lb. of superphosphate, 62 lb. of potassium sulphate, and 15 lb. of ammonium sulphate, or 22 lb. of dried blood. Peanuts are largely used in the manufacture of confections and food products. They are rich in oil, and the yield of oil is richer in tropical climates than in temperate zones.—*S. E. W.*

Pear Aphis, The Woolly (*Eriosoma pyricola*). By A. C. Baker and W. M. Davidson (*Jour. Agr. Res.* x. pp. 65–74, July 1917; plates).—This species forms galls on the roots of the pear, and passes the summer in galls on the foliage of the elm. Full descriptions are given, and the authors believe the species to have been introduced from Europe to the States and found it to be capable of living on the American as well as the European elm. They suspect it to be identical with *E. lanuginosa.*—*F. J. C.*

Peas. By A. F. Pearson (*Irish Gard.* xiii., March 1918, pp. 33–35).—A cultural article, dealing with pea cultivation, pests of peas, and so on.—*E. T. E.*

Peas for Poor or Shallow Soils. By F. R. Castle (*Gard.* May 5, 1917, p. 155).—The author considers the selection of varieties to be important and recommends the following:—

Essex Star	Royal Salute
Duke of York	Glory of Devon
Triumph	Dr. McClean
Senator	Knight's Ever-bearing
Rentpayer	Autocrat
Eureka	Late Queen

which have been selected from a trial of over thirty varieties all sown on the same date upon soil of the poorest possible nature. The height of the varieties mentioned rarely exceeds 4 feet.—*H. R. D.*

Peppermint and Spearmint. By W. van Fleet (*U.S.A. Dep. Agr., Farm. Bull.* 694; Oct. 10, 1915).—There are two varieties of peppermint cultivated in America, the so-called white and black mints. The white variety yields the finest quality of oil, but the plant is less hardy and productive than the black mint and is now little cultivated in the States.

Peppermint-growing has spread widely in America, and many thousands of acres are under the crop.

Both peppermint and spearmint thrive best in deep soils rich in humus and retentive of moisture, but fairly open in texture and well drained either naturally or artificially.

These conditions are frequently combined in effectively drained swamp lands, but the plants may also be commercially cultivated in well-prepared upland soils, such as would produce good corn, oil, or potatos.

This bulletin gives instructions for culture in such upland soils and also in what are known in America as muck land, that is, those broad level areas, often several thousand acres in extent, of deep fertile soil, the beds of ancient lakes and swamps where the remains of ages of growths of aquatic vegetation have accumulated. In Michigan and Indiana, where there are large areas of such land susceptible of thorough drainage, mint culture has become highly specialized, a considerable part of the acreage being controlled by a few well-equipped growers able to handle the product in an economical manner.

Mint culture on suitable soils seems to give fair average returns when intelligently conducted from year to year. The product is, however, liable to

fluctuation of price, and is likely to suffer from over-production if the acreage is too rapidly extended. The cost of establishing the crop and the annual expenses of cultivation are high.—*M. L. H.*

Perennials Attacked by Sclerotinia Rolfsii. By Geo. L. Peltier (*U.S.A. Exp. Stn. Illinois, Cir.* 187, July 1916).—In the summer of 1915 large numbers of perennials were found to be attacked by a fungus, *Sclerotinia Rolfsii* (Sacc.), which hitherto was confined to the more Southern States. Usually the first indication of the disease is a yellowing and drooping of the leaves of the attacked plant. The fungus attacks the plant on the stem just above the ground and soon spreads to the roots, finally causing a soft rot of all the parts underground. Sclerotia are soon developed and resemble mustard or radish seed in appearance.

Amongst the perennials attacked were the following: *Campanula Medium, C. persicifolia, C. carpatica, C. nobilis, Erigeron glabellus, Dianthus plumarius, Dracocephalum argunense, Pentstemon pubescens, P. Murrayanus, Phlox subulata,* and *Eupatorium ageratoides.* Of these the Campanulas were the most susceptible, especially *C. Medium.*—*A. B.*

Persimmon, The Native. By W. F. Fletcher (*U.S.A. Dep. Agr., Farm. Bull.* 685, Oct. 12, 1915; pl.).—The Persimmon is indigenous in the S.E. quarter of the United States; and the presence of single specimens in Rhode Island and Michigan show that the northern limit of its cultivation could quite well be extended.

The high food value of the fruit is not sufficiently appreciated. Masses of the crop go to waste for want of knowing how it may be used. Attempts to improve upon existing varieties by cross-breeding have also not been completely successful because one essential factor has been overlooked.

The Persimmon is generally dioecious, the pollen being distributed by bees and by the wind. In attempting to improve upon native varieties by crossing, the characteristics of the pollen-bearing parent should be also studied, and such parent should be selected among trees grown from seed produced by the most desirable fruit-bearing trees.

Various methods of cultivation and of propagating are here described, and the few diseases of the Persimmon are described. The wood is used for bobbins in cotton-mills, and the fruit is a valuable food for man and beast. Its intense astringency disappears when the fruit is fully ripe, but, as heat appears to make this astringency more apparent, an antidote in the form of half a teaspoonful of carbonate of soda should be added when the fruit is cooked. Recipes are given, and descriptions of some of the better-known varieties.—*M. L. H.*

Picea bicolor. By Professor Henry (*Irish Gard.* xiii., Feb. 1918, pp. 17–18; 2 figs.).—*E. T. E.*

Pine Bark Beetle. By W. A. Clemens (*U.S.A. Exp. Stn., Cornell,* October 1916).—The genus was formerly known as Tomicus, but the synonymy according to Swaine (page 77 of reference cited) gives the name Ips De Geer (1775) priority. The species was described by Say (1827).

It is common and widely distributed, inhabiting the transitional and Canadian faunal zones from the Pacific to the Atlantic and from about 37° to 55° N.

Removal of the bark will cause the death of all larvæ and pupæ of the pine bark beetle. If a little care is taken in the removal and the bark is burned immediately, a large number of the adults may also be destroyed. Removal and burning of the bark in winter where adults are known to be in hibernation will do much to lessen attacks in the season following. Where water is available the placing of newly felled logs in the water will prevent injury by the beetles.
A. D. W.

Pisum sativum, Bacterial Disease of. By Dorothy M. Cayley (*Jour. Agr. Sci.* vol. viii. part 4, Dec. 1917, pp. 461–479; pl. 7).—This is a report of further investigations of a bacterium for which the author proposes the name *Pseudomonas seminum.* The organism is a motile, sporing, facultatively anaerobic bacillus, capable of growth on acid, neutral, and alkaline media. It is found in large numbers in the tissues of the cotyledons of the Pea. A discoloured patch in the centre of the cotyledons is typical, but it is not possible to tell from the exterior of the seed whether it is or is not infected. From the cotyledons the infection spreads to the tissues of the stem and leaves. In mild cases the shoot may develop normally, but later the stem turns slightly brown and looks somewhat water-soaked. In bad cases either the seed does not germinate or the plumule and radicle show brown streaks and growth is limited. The organism can penetrate uninjured tissues from the outside only when they are very young.

Details of morphology are given. Attempts to find an immune variety have been unsuccessful, but the taller of the early varieties of peas show considerably less disease than the later varieties. So far no cure is known, but attention to rotation, early sowing, adequate drainage, sufficiency of lime in the soil and burning of diseased haulm are recommended. The disease is a serious one, and appears to be on the increase.—*J. E. W. E. H.*

Plums, Cherries, and Apples, Report on Tests of Self-sterility of. By I. Sutton (*Jour. Genetics*, vol. vii. pp. 281–300, Aug. 1918; plate).—Trials carried out by various observers at the John Innes Institution indicate that of Plums—'Coe's Golden Drop,' 'Coe's Violet,' 'Crimson Drop,' 'Jefferson,' 'Bryanston Gage,' 'McLaughlin's Gage,' 'Early Green Gage,' 'Old Green Gage,' 'Reine Claude d'Althan,' 'Pond's Seedling,' 'Wyedale,' 'Frogmore Orleans,' 'Late Orleans,' 'Prune d'Agen,' 'Primate,' and 'Frogmore Damson' are self-sterile; 'Rivers' Early Prolific,' 'Early Favourite,' 'Cox's Emperor,' 'Early Orleans,' and 'Farleigh Damson' are partly self-sterile; 'Denniston Superb,' 'Early Transparent,' 'Reine Claude Violette,' 'Golden Transparent,' 'Reine Claude Bavay,' 'Oullin's Golden Gage,' 'Bèlle de Louvain,' 'Monarch,' 'Prince Engelbert,' 'Prune Géante,' 'Gisborne,' 'Victoria,' 'Pershore,' 'Yellow Magnum Bonum,' 'Early Mirabelle,' 'Kyrobalan Red,' and 'Belgian Purple,' are self-fertile. Self-fertile Cherries include 'Amber Heart,' 'Black Eagle,' 'Black Heart,' 'Black Tartarian,' 'Biggareau de Schreken,' 'Noir du Guben,' 'Napoleon,' 'Jaboulay,' 'Frogmore Early,' 'Early Rivers,' 'Elton,' 'Governor Wood, 'Guigne d'Annonay,' 'Kentish Red,' 'Toussaint,' 'Waterloo,' 'White Heart'; 'May Duke' and 'Archduke' are partly self-fertile; 'Flemish Red,' 'Late Duke,' and 'Morello' are self-fertile. Of apples at the Institution, 'Beauty of Bath,' 'Cox's Orange Pippin,' 'Gascoyne's Scarlet,' 'Lane's Prince Albert,' 'Norfolk Beauty,' 'Northern Greening' appear self-sterile; 'Worcester Pearmain,' 'Bramley's Seedling,' 'Lord Hindlip,' 'Lady Sudeley,' 'Old English Broadleaf,' 'Doucin,' 'Improved Doucin,' *Pyrus prunifolia, P. baccata,* 'Golden Russet,' partly self-fertile; and 'Antonowka,' 'Annie Elizabeth,' 'Baldwin,' 'Celline Pippin,' 'Coronation,' 'Duchess of Oldenburgh,' 'Golden Spire,' 'King of the Pippins,' 'Lord Derby,' 'Red Winter Reinette,' 'Ribston Pippin,' 'Stirling Castle,' 'Sturmer Pippin,' 'Washington,' 'French Paradise,' and 'Crimson Bramley,' self-fertile.—*F. J. C.*

Plums, Winter Aspect of Buds. By E. A. Bunyard (*Gard. Chron.* Jan. 19, 1918, p. 23, with fig.).—Calls attention to a useful method of recognizing certain varieties when leafless.—*E. A. Bd.*

Potato, A New Strain of Rhizoctonia Solani on. By J. Rosenbaum and M. Shapovalov (*Jour. Agr. Res.* ix. pp. 413–420; June 1917; plates.—Two "strains" of *Rhizoctonia Solani* have been isolated rom the Potato, the new one discussed by the authors producing more pronounced lesions than the better-known one, both upon injured stems and tubers, and may, furthermore, be distinguished by its reaction growth, and the character of the sclerotia on d fferent med a, and by the measurements of its cells.—*F. J. C.*

Potato, "Blackleg" of the. By S. G. Paine (*Journ. Agr. Sci.*, vol. viii. part 4, Dec. 1917, pp. 480–494).—The two recognized bacterial diseases of the potato in this country are "Blackleg" and "Brown Rot." At present they cause a loss of not more than 5 per cent. of the Potato crop of Great Britain, but there are signs that they are on the increase, and it is possible that they may become as serious pests with us as in Canada and Galicia. The author has made a thorough investigation of the organism which causes "Blackleg." This disease usually appears in June. The symptoms are wilted and yellow leaves, which later turn almost black. The stem at the ground level shows a blackened area, and if gently pulled leaves the soil with hardly any resistance. There is an almost entire absence of development of the tubers unless infection has taken place late in summer. In that case the tubers are infected, the vascular ring being seen to be stained brown. The propagation of the disease is due as a rule to the planting of diseased sets, and this accounts for the fact that the disease makes its appearance in isolated individuals and is but rarely found to be affecting even small patches. It is thought, however, that the disease may be sometimes introduced from the soil into the plant by biting insects.

The author shows that the organism which produces "Blackleg" of the potato is *Bacterium atrosepticus* (van Hall), and that it is identical with the organism which produces the disease in Ireland, and has been described by Pethybridge and Murphy under the name of *B. melanogenes*.

As regards control, the planting of healthy seed tubers is obviously of great importance. It has also been noticed (in one instance only, however) that a

plot of shallow-planted tubers showed a much higher percentage of diseased plants. Deep planting may therefore exercise a deterrent influence on the Bacteria.—*J. E. W. E. H.*

Potato Blackleg Disease. By W. J. Morse (*Jour. Agr. Res.* viii. pp. 79–126, Jan. 1917).—This disease is prevalent in certain seasons in Great Britain, and is characterized by a pronounced blackening of the base of the stem. Plants affected are generally unthrifty and undersized, leaves and branches tend to grow upward instead of spreading, forming a more or less compact top, later becoming light green or yellow, and whole plant eventually dying. A careful description of the appearance and predisposing causes of the disease are given, as well as notes upon the geographical distribution of the disease. The author recommends the rigid rejection of all seed tubers in any way cracked, bruised, discoloured or decayed, and the disinfection by steeping in formaldehyde of all tubers selected for planting. He carried out a careful investigation of the causal bacillus, which he recognizes as identical with that described by van Hall, whose description he revises, *Bacillus atrosepticus*, and considers *B. melanogenes* of Pethybridge and Murphy to be synonymous.—*F. J. C.*

Potato Disease, A Form of, produced by Rhizoctonia. By G. B. Ramsey (*Jour. Agr. Res.* ix. pp. 421–426; June 1917; plates).—Two phases of damage to the potato tuber occur as a result of the attack of *Rhizoctonia Solani*; (1) somewhat resembles scab and extends as a dry core into the flesh of the tuber, (2) the shrinkage of the tissues produces a p t in the centre of the infected area somewhat like the attack of wireworm. Evidence is adduced in support of the idea that these symptoms are produced as a direct result of the attack of the fungus.—*F. J. C.*

Potato Diseases in Michigan. By G. H. Coons (*U.S.A. Dep. Agr. Exp. Stn. Mich., Special Bull.* 85, March 1918, pp. 1–48; 41 figs. in text).

Potato Diseases in Indiana. By H. S. Jackson and G. A. Osner (*U.S.A. Dep. Agr. Exp. Stn., Purdue, Cir.* 71, Sept. 1917, pp. 1–16).—The two bulletins give a popular account of the commoner diseases of the potato which are frequently met with in the two States, and give detailed directions for the making of Bordeaux mixture for spraying purposes.

The methods of control in general fall into three groups: (1) Sanitary and hygienic measures; (2) plant protection measures; (3) the use of resistant varieties or strains.

The first means clean seed in clean soil; the second deals with spraying as a measure of protection; while the third means the production of immune varieties.—*A. B.*

Potato Diseases, Investigations of. By G. H. Pethybridge (*Jour. Dep. Agr. Ireland,* xvii., pp. 1–8; 1917).—One per cent. Burgundy and Bordeaux mixtures were again found to be about equally efficacious with the 2 per cent. solutions when used against Phytophthora attack, but the latter is still regarded as to be preferred, mainly on the ground that the former needs more careful application.

In comparative trials against Phytophthora attack several varieties, in which the foliage proved somewhat susceptible, gave a very low percentage of diseased tubers, but conversely 'Champion II.' and 'Northern Invincible,' which are resistant in a high degree so far as foliage is concerned, produced a considerable percentage of diseased tubers, higher even than 'King Edward VII.,' in which the foliage is markedly susceptible.

Observations on the sclerotia of the Botrytis disease have failed to demonstrate the formation of an ascospore stage. In all cases the sclerotia on germination have produced Botrytis spores.

The Verticillium disease due to *Verticillium atro-album*, which causes a wilt disease of the plant, was found to be controllable by subjecting the tubers to a temperature of 46° C. for twenty hours (and in one case the mycelium in the tubers was dead at the end of ten hours). Further experiments are in progress with this disease.—*F. J. C.*

Potato Dry-rot, Further Observations on. By G. H. Pethybridge and G. A. Lafferty (*Sci. Proc. Dublin Soc.* xv. No. 21; June 1917).—The authors show that the dry-rot of potatos in the British Isles is due as a rule to *Fusarium caeruleum*, not to *Fusarium Solani* Sacc. Recent work has enabled the distinctions between the species of this difficult genus to be more clearly grasped, and at the same time has cast doubt upon the correctness of the nomenclature of the fungi believed

to be the cause of dry-rot in the past. No connexion with a species of Nectria has been traced. The authors state that the dusting of potatos in the clamp with quicklime and sulphur has no preventive value, but the experiments upon which this statement is based do not approximate to those in the clamp. The fungus more easily attacks the tuber later in the season than early, and the authors recommend that no diseased tubers should be planted. The fungus does not produce a wilt disease as do some other species of the genus.—*F. J. C.*

Potato "Leak," The Control of. By L. A. Hawkins (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 577, Sept. 1917, pp. 1–6).—The disease known as potato leak is caused by various organisms. Amongst the chief are *Rhizopus nigricans* (Ehrenb.) and *Pythium Debaryanum* (Hesse). The fungi obtain an entrance through wounds in the skin of the tubers and cause complete rottenness in the tubers. It is evident from the experiments that removal of all the wounded tubers from the stored potatos is the most effective means of control, and care should be taken to avoid damaging the tubers when lifting them.—*A. B.*

Potatos, Lime Sulphur *versus* Bordeaux Mixture as a Spray for. IV. By M. T. Munn (*U.S.A. Exp. Stn., Geneva, N.Y., Bull.* 421, May 1916).—The author in this bulletin again emphasizes the results obtained by use of lime sulphur on potatos.

Lime sulphur as a spray injures the potato foliage, does not prevent the blight, and its use results in a marked decrease of tubers.—*C. P. C.*

Potatos in Maine. By C. T. More (*U.S.A. Dep. Agr., Circ.* 48, April 2, 1915).—The conditions of potato-growing in Maine in 1915 gave rise to dissatisfaction among local growers, as they felt that the prevailing low prices of their crops were not justified. The extremely heavy production, together with the unsettled conditions, seem to have been responsible for the fall in prices.

This bulletin suggests improved methods of harvesting and marketing which would make for economy and urges rigorous grading of the crop through co-operative effort.—*M. L. H.*

Prickly Pear and Insects. By W. W. Froggatt (*Agr. Gaz. N.S.W.*, vol. xxviii. pp. 417–426; 4 plates).—Attempts to destroy Prickly Pear by Wild Cochineal, Round Cactus Scale (*Diaspis calyptroides*), the Rutherglen Bug (*Nysius vinitor*), and other insects have not been successful. It is now proposed to experiment with the large land snail (*Helix aspera*).—*S. E. W.*

Prickly Pear, Destruction of. By G. P. Darnell Smith (*Agr. Gaz. N.S.W.* vol. xxix. pp. 1–12; 6 figs.).—At least two operations are necessary completely to destroy prickly pear by spraying. The spray is prepared by dissolving 20 lb. of white arsenic in 10 gallons of water containing 5 or 10 lb. of caustic soda. The application is best made in autumn. This destroys the segments, but in order to kill the roots the pears are slashed and re-sprayed. The dead cacti are raked together and burnt.—*S. E. W.*

Prickly Pears. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 650–652; 1 coloured plate).—*Opuntia vulgaris* has ovate joints and numerous short prickles. It bears spreading yellow flowers. This cactus is not found in Australia, but the name is frequently incorrectly given to the pest pear *O. inermis.*—*S. E. W.*

Primula malacoides. By A. W. Hill (*Jour. Genetics*, vol. vii. pp. 193–198, May 1918; plates).—Records the course of development of the now fairly numerous varieties of *P. malacoides*, first introduced to cultivation in 1908.
F. J. C.

Prumnopitys elegans. By A. Bruce Jackson (*Gard. Chron.* Jan. 12, 1918, p. 12, with 2 figs.)—The eighteenth of this series of critical notes on Conifers. Discusses establishing a separate genus for the group in which the receptacle does not become fleshy, under the name *Stachycarpus.*—*E. A. Bd.*

Pyrus triloba. By L. Trabut (*Rev. Hort.* vol. xc. pp. 8–9; 4 figs.).—*Pyrus triloba* is an ornamental tree valuable on account of its regular growth, and its beautiful foliage and flowers. Its fruit resembles that of the crab. It is very acid, but is used for making jellies. It is probable that the value of the fruit would be improved by cultivation.—*S. E. W.*

Radium as a Fertilizer. By C. G. Hopkins and W. H. Sachs (*U.S.A. Exp. Stn., Ill., Bull.* 177, Jan. 1915).—This bulletin confirms the whole of the experiments carried out with radium as a fertilizer. The authors clearly demon-

strate that there is no foundation for the belief that an increased crop yield, commensurate with expenditure incurred, may be expected from its use.
C. P. C.

Raspberry and Loganberry Beetle. By A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—The beetle *Byturus tomentosus* causes so much damage to raspberries and loganberries as to threaten the loganberry industry in some places. Three sprayings with nicotine wash were instrumental in reducing the amount of infection to a marked degree. The method was to spray with 2 per cent. paraffin emulsion and five minutes afterwards with a nicotine wash, consisting of soft soap 20 lb., paraffin 2 gallons, nicotine ½ lb., water 100 gallons.
F. J. C.

Rats: How to exterminate them. By R. Sharpe (*Jour. Bd. Agri.* vol. xxiv. No. 12 vol. xxv. No. 1).—A long article by a practical man which cannot be properly abstracted. It points out the great losses due to rats, their natural enemies, and various methods of poisoning, trapping, &c. Illustrations are given of traps in position.—*G. C. G.*

Rhizoctonias Parasitic in America. By Geo. L. Peltier (*U.S.A. Exp. Stn., Illinois, Bull.* 189, pp. 283–390, June 1916; 23 figs.).—Two species of truly parasitic Rhizoctonias are recognized in America: the common form (*Rhizoctonia Solani* Kühn), *Corticium vagum* B. and C., which is widely distributed and occurs on a large number of plants; and *Rhizoctonia Crocorum* (Pers.) DC., with alfalfa and potato as hosts. Another Rhizoctonia, *Corticium ochroleucum* (Noack) Burt, is occasionally found on leaves of apple and pear. About 165 species of plants are more or less subject to attacks of Rhizoctonia.

The author thinks, as a result of inoculation experiments with numerous types of plants, that all the strains, obtained from a wide range of hosts of different geographical origin, can attack the same species of plant and produce the same characteristic symptoms. The virulence of *R. Solani* is variable, and it is found abundantly in cultivated soils, where it can live upon weeds or dead organic material.—*A. B.*

Rhododendron auriculatum. By A. D. (*Irish Gard.* xii., Oct. 1917, p. 149).—A striking new species introduced by E. H. Wilson from China.—*E. T. E.*

Rhododendron oreotrephes. By J. W. B. (*Irish Gard.* xiii., Jan. 1918, p. 5).—A brief descriptive note on this desirable new species, discovered by George Forrest. Its rosy-lavender flowers make it attractive.—*E. T. E.*

Rhododendron rubiginosum. Anon. (*Irish Gard.* xiii., Aug. 1917, p. 118; 1 fig.).—A useful but neglected species introduced by Abbé Delavay. It should be much more largely grown. It flowers in April and May, colour being rosy lilac.—*E. T. E.*

Rhododendrons, Chinese. Anon. (*Irish Gard.* xiii., May 1918, p. 72; 1 fig.).—A note on some useful Rhododendrons collected in China by George Forrest.—*E. T. E.*

Rhododendrons, Some Notes on. By J. R. of B. (*Irish Gard.* xiii., June 1918, pp. 82–86).—A delightful article by a well-known tree and shrub enthusiast, dealing with a large number of beautiful species and varieties.
E. T. E.

Rosa cerasocarpa Rolfe (*Bot. Mag.* t. 8688; Dec. 1916).—A climbing species with many-flowered clusters of white flowers in June, each about 1¼ inches across, and deep-red globose fruits in November. The sepals and styles are deciduous. Native of China.—*F. J. C.*

Rosa Davidii Crép. By R. A. Rolfe (*Bot. Mag.* t. 8679; Oct. 1916).—A hardy shrub 5 to 6 feet high, with leaves 3 to 4 inches long, grey-puberulous beneath, and rose-pink flowers about ¾ inch across in loose corymbs. Fruits ovoid, pink, with persistent sub-erect sepals. Common in mountains of Moupine, W. Szechwan, where the seed was collected by Mr. Wilson in 1908.—*F. J. C.*

Rosa Moyesii. By R. M. P. (*Irish Gard.* xiii. p. 107, July 1918).—A beautiful plant introduced by Wilson. Flowers large, and brick-red colour. Bush habit. Height, 6–8 feet. Fruits dark red, bottle-shaped. Propagation by seeds sown indoors.—*E. T. E.*

Rose Diseases, More about. By L. M. Massey (*Amer. Rose Annual*, pp. 63–71, April 1918).—Crown canker, black spot, and mildew of the rose are dealt with. *Cylindrocladium scoparium* is the fungus producing crown canker, a lingering disease causing cracking and cankering at the base of the stem and yellowing of the foliage. Thorough drainage, soil sterilization, and the selection of healthy scions and stocks are the control measures recommended. Dust spraying for black-spot and mildew was found more effective than lime-sulphur or Bordeaux mixture, the sulphur-arsenate mixture being recommended. (See these Abstracts, "Dusting and Spraying Nursery Stock.")—*F. J. C.*

Rose, The Dunwich. By Viscount Dunwich (*Gard.* Oct. 13, 1917, p. 428).—The Dunwich Rose is a very nearly true *R. hispida*. It is bushy, and never grows more than 2½ to 3 feet high. Leaflets are 7 to 11, serrated. This rose is almost extinct. It was no doubt growing in the ruins of Dunwich, and has been cultivated. The flower is semi-double and grows in groups of three; it is almost white, but has a tinge of yellow. On p. 304 (Aug. 4) Mr. James Britten had suggested that this rose was a variety of *R. spinosissima*, and this view is adopted in a note by the editor.—*H. R. D.*

Roses for Cutting, Long-stemmed. By G. J. (*Gard.* June 22, 1917, p. 220).—The author recommends Mme. Alfred Carrière (white) and Zéphyrine Drouhin (rose), the latter to be grown as a hedge with access on both sides. The rose-red blooms are not only deliciously sweet, but they are well shaped and long-lasting, and the almost entire absence of prickles makes it a pleasant rose to cut by the armful.—*H. R. D.*

Roses, Hybridation of. By J. Perney-Ducher (*Le Jard.* vol. xxxii. p. 205).—The author observed the formation of a hybrid of a yellow 'Pernetiana' and the red hybrid tea 'Admiral Ward.' The parents were grown side by side in a border, and the fertilization was probably due to bees. This is believed to be a unique case of the production of such a hybrid without human aid.—*S. E. W.*

Roses, Sweet Scented. By H. Blin (*Rev. Hort.* vol. lxxxix. pp. 336, 337).—The following roses are remarkable for their perfume: 'La France,' 'La France Victorieuse,' 'Baronne de Rothschild,' 'Mrs. John Laing,' 'Madame Maurice de Luze,' 'François Juranville,' 'Gerbe Rose,' 'Marie Baumann,' 'Charles Lefèbre,' 'Etienne Lebet,' 'Commandant Félix-Faure,' 'Dupuy Jamain,' 'Prince Arthur,' 'Sénateur Vaisse,' 'A. K. Williams,' 'Général Jacqueminot,' 'Madame Gabriel Luizet,' 'Hugh Dixon,' 'Horace Vernet,' 'Augustine Guinoisseau,' 'Richmond,' 'Vicomtesse Folkestone,' 'Château de Clos-Vougeot,' 'General MacArthur,' 'Betty,' 'John Ruskin,' 'Lady Alice Stanley,' 'Catherine Mermet,' 'Muriel Graham,' 'Innocence,' 'Mme. Cusin,' 'Devoniensis,' 'Souvenir de S. A. Prince,' 'Goubault,' 'Souvenir de William Robinson,' 'Lady Roberts,' 'Maréchal Niel,' 'Lamarque,' 'L'Idéal Mme. Alfred Carrière,' 'Isaac Pereire,' 'Zéphirine Drouhin,' 'Anna Maria de Montravel,' 'Léonie Lamesch,' 'Stanwell Perpetual,' 'Nitida,' 'Altaica.' 'Alpina' has a curious resinous scent, and 'Indica semperflorens' possesses a very penetrating and peculiar odour.
S. E. W.

Sanguisorba obtusa* var. *amoena Jesson (*Bot. Mag.* t. 8690; Dec. 1916).—A hardy perennial from Japan, growing 3 to 4 feet in height with large radical leaves and cylindric spikes of rose-purple flowers. Introduced by Messrs. Barr.
F. J. C.

School Garden and Allotments. By L. J. R. (*Irish Gard.* xiii., Jan. 1918, p. 11).—Contains some sound advice on School Gardening.—*E. T. E.*

Sciara Maggots injurious to Potted Plants. By H. B. Hungerford (*Jour. Econ. Entom.* 9, p. 538, Dec. 1916; figs.).—Reports damage to pot plants by the shiny, black-headed white larvae of *Sciara coprophila*, which fed upon roots and stems. The life-history was worked out in detail, and some suggestions are made as to dealing with the pest.—*F. J. C.*

Silene pennsylvanica. By E. H. Jenkins (*Gard.* May 12, 1917, p. 167; fig.).—The 'American Wild Pink,' though known to cultivators for a century or more, is by no means common even in good collections of alpine plants.

The flowers vary from purplish rose to rose pink, and all are beautiful. Growing 6 or 8 inches high it ranks to-day among rock-garden varieties, so good as to merit general cultivation. In its North American home it favours sandy, rocky, or gravelly places, though experience proves these are not essential, and that it

will grow quite well in deep gritty loam. It is easily raised from seed, but by no means easy to increase otherwise. Slugs are fond of it.—*H. R. D.*

Skin Irritation, Plants and. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxix. pp. 344–345).—Inflammation of the skin is caused by contact with the following plants: Noogoora Burr (*Xanthium strumarium*), Stinkwort (*Inula graveolens*), and *Senecio Hectori*.—*S. E. W.*

Snowdrops, Autumn Flowering. By E. A. Bowles (*Gard.* p. 4, Jan. 6, 1917).—The suggestion that these are forms of *Galanthus nivalis* does not apply to the two known as *G. Olgae* and *G. Rachelae* which flower in the end of October. *G. cilicius* must be reckoned as a form of *G. nivalis*, showing its buds before the shortest day, and so earlier than the type. *G. byzantinus* and *G. Elwesii* are apt to flower early the first season after planting, and then gradually accommodate themselves to the snowdrop season, but certain individuals of *G. byzantinus* retain the early-flowering habit (in flower December 20). *G. Elsae* and *G. Olgae* probably prove consistently autumnal.—*H. R. D.*

Soil Acidity and the Hydrolytic Ratio in Soils. By C. H. Spurway (*Jour. Agr. Res.* xi. 12, pp. 659–672).—Investigations in soil acidity indicate a relationship between iron and aluminium compounds in soils and their reaction to litmus paper and phenolphthalei ndicator. The author finds that all the acid soils have ratios $CaO : Fe_2O_3 + Al_2O_3$ above 1 : 1·3, and all alkali soils have ratios below this figure. He believes that the reactions of the soils depend chiefly upon the hydrolytic ratios existing between the compounds of the alkali earths and iron and aluminium.

A method of determining the calcium oxide required to neutralize a soil by indirect titration is described where a standardized calcium hydroxide solution is allowed to react with varying amounts of soils. The concentrations of soil and solution giving a neutral reaction are found by comparing the electrical resistance of the several solutions, and also by phenolphthalein. The greatest electrical resistance and faint colour of the indicator is coincident with the concentration giving a neutral reaction.

The quantities of lime required to neutralize the acid soils is determined by computing the quantities of calcium oxide necessary to add to the acid-soluble calcium oxide found in the soils to bring the ratios $CaO : Fe_2O_3 + Al_2O$ to 1 : 1·3. The quantity required corresponds closely with the quantities required when determined by the indirect titration method.

A short bibliography is appended.—*A. B.*

Soil, Effect of Decomposing Organic Matter on the Solubility of Certain Inorganic Constituents of the. By C. A. Jensen (*Jour. Agr. Res.* ix. pp. 253–268).—The author finds the solubility of compounds of calcium, magnesium, iron, and phosphoric acid in soils measurably increased by the addition of green manures, stable manures, and their extracts.—*F. J. C.*

Soil Flora Studies. By H. Joel Conn (*U.S.A. Exp. Stn., New York, Tech. Bull.* 57, 58, 59, 60, Jan.-March 1917).—The first of this series deals with the general characteristics of the microscopical flora of the soil, and the methods best adapted to the study of the soil flora. The second bulletin deals with the spore-forming bacteria in soil; the third with the non-spore-forming bacteria; and the last one deals with the form Actinomycetes in soil.

The soils were obtained from various parts of New York State, and the results obtained have extended over eight years. The determinations were made by the plate method, since this enabled the relative number of different organisms in the soil to be ascertained. Over 1,000 pure cultures of these organisms were made, and their characteristics studied by various methods. Non-spore-forming bacteria (mostly non-motile rods) were most abundant, and next to these are the various types of Actinomycetes. Spore-forming bacteria have also been found, but in no great numbers. The author's conclusions may be set forth as follows:

1. Of the spore-forming bacteria in these soils, *Bacillus megatherium* (Debary), *B. mycoides* (Flügge), *B. cereus* (Frankland), were the most abundant. *B. simplex* (Gottheil) also occurs in somewhat smaller numbers. These bacteria are ordinarily inactive in soil and form a relatively small part of the flora of the soil, and seem to occur in normal soil only as spores.

2. The largest number of soil bacteria were found to be non-spore-forming organisms. Of these the most abundant type is *B. fluorescens* (Flügge) Migula, especially in well-aerated soils, or soils containing organic matter recently added, but in older soils the numbers of this organism are considerably reduced. This seems to indicate that they are amongst the most active of soil micro-organisms.

3. From 12 to 50 per cent. of the colonies on plate cultures are those of Actinomycetes. The author finds about seventy different types occur; three of them are of fairly common occurrence, and of these one is considered to be a new species, *A. pheochromogenus*; another appeared to be associated with potato-scab organism; while the third is not a distinct species. Indications show that they are an active and numerically important group of micro-organisms in soils.—*A. B.*

Soil Moisture, The Movement of Soluble Salts with the. By F. S. Harris (*U.S.A. Exp. Stn., Utah, Bull.* 139, May 1915).—Large tracts of low-lying lands have of late years accumulated alkali salts to such an extent as to cause them to go entirely out of cultivation.

It is found that this infertility is caused by the movement of soluble salts from the uplands through the excessive irrigation of same.—*C. P. C.*

Soil, Potassium from. By C. G. Hopkins and J. P. Aumer (*U.S.A. Exp. Stn., Ill., Bull.* 182, May 1915).—The addition of green and farm manures to the soil will normally release more than sufficient potassium for the use of most farm crops, particularly corn and clover. The authors suggest that no further artificial additions should be made.—*C. P. C.*

Soil, Summer Treatment of Greenhouse. By W. J. and S. N. Green (*U.S.A. Exp. Stn., Ohio, Bull.* 281, Jan. 1915).—It is customary in the above State to allow the greenhouses to lie fallow for six to ten weeks in the summer, expecting that the dryness and heat would clear off most of the pests inherent to glasshouse cropping.

By some comprehensive experiments the authors show that it is better to manure, mulch, and water the top soil, such treatment considerably adding to the crop later on.

The only exception being a following crop of lettuce which seems to do almost equally well in the dry or mulched soils.

Sterilization is recommended, but the authors deprecate the constant application of steam for this purpose, as it tends to strong stimulation of growth leading to malnutrition. It has also been shown that harmful compounds as well as beneficial are formed, and when the former overbalance the latter the fertility of the treated soil is affected adversely. Some hints as to feeding and watering are given.—*C. P. C.*

Soil, The Effect of Sulphate of Ammonia on. By R. W. Rupprecht and F. W. Morse (*U.S.A. Exp. Stn., Mass., Bull.* 165, Nov. 1915).—From the numerous experiments carried out over a number of years, the authors deduce that the constant application of sulphate of ammonia to unlimed soils does not tend to create acidity. In the various trials both unlimed and limed plots remained neutral under repeated yearly doses. The decomposition of sulphate of ammonia in the soil is, in the first stage, an absorption of the ammonia until the soil cannot hold any more, such absorption being greater in the limed soil. Any sulphate remaining is then decomposed in the soil, first attacking the calcium carbonates and in their absence the salts of iron and aluminium, and it is to the presence of the resulting compounds of iron and aluminium that the harmful effects of the constant application of sulphate of ammonia to unlimed soils appear to be due.—*C. P. C.*

Soils, Effect of Temperature on Some of the most Important Physical Processes in. By George J. Bouyoucos (*U.S.A. Exp. Stn., Mich., Tech. Bull.* 22, July 1915).—Many valuable and interesting results are tabulated in this bulletin.

The most striking conclusions are: (1) "That there is practically no loss of vapour during the night, and that contrary to popular belief the dew is not caused by the water vapour rising from the soil. (2) That the influence of temperature on the aeration of soils is very great."

This is caused not only by the expansion of the gases, but by absorption by soils at different temperatures, and particularly through the presence of soil moisture as vapour.—*C. P. C.*

Soils, Factors influencing the Lime and Magnesia Requirements of. By W. H. MacIntyre (*U.S.A. Exp. Stn., Tenn., Bull.* 105, Jan. 1916; 23 tables).—The above is a purely technical bulletin dealing with a "Method for the determination of the immediate lime requirements."

Therein is described the newest methods and the apparatus to be used.

It is demonstrated that SiO_2 is very active in the decomposition of lime and magnesium carbonates in soils.—*C. P. C.*

Soils, The Use of Dynamite on the Improvement of Heavy Clay. L. E. Call and R. I. Thockmorton (*U.S.A. Exp. Stn., Kansas, Bull.* 209, Dec. 1915).—It was anticipated by some that the use of explosives would be the means of lessening the labour of improving soils. This is the case with some types of soil, but the experiments set out in the above bulletin show that on heavy clay soils the use of explosives is distinctly detrimental.

The soil was blown into jug-shaped cavities, the sides of which were compacted and partially baked, so that the complete "dynamite jug" could be dug out weeks afterwards.

Such cavities quickly filled with water, which remained for a considerable time to the detriment of the trees planted in them. Trees planted near the holes were no better than those placed on untreated land.—*C. P. C.*

Soy Bean, The. By C. V. Piper and W. J. Morse (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 439, Dec. 20, 1916, 20 pp.; 3 figs., 12 tables).—A valuable oil can be extracted from the Soy Bean, and the residue ground into meal suitable for both human and animal food. It has also a high value as a fertilizer, but is more economically fed to stock, and the resulting manure applied to the soil. The oil has been used for soap-making, and (after refining) as an edible table oil, or in the manufacture of butter substitutes. Other uses are in the manufacture of linoleum, of a rubber substitute, and of certain types of paint.—*F. G. A.*

Spinach Carrion Beetle (*Silpha bituberosa* Lec.). By R. A. Cooley (*Jour. Econ. Entom.* x., pp. 94–102; Feb. 1917).—In the States, so far as is known, this beetle does not occur west of the main divide of the Rocky Mountains excepting in Idaho. Its usual food is weeds belonging to the Chenopodiaceae, and it appears to migrate into the sugar-beet fields from this source. The beetle and larvæ are most injurious when the plants are very small, and feed mostly at night time. A closely allied species *S. opaca* is one of the most troublesome insect pests to beet-growers in Germany, and troublesome at times in Britain. The most effective remedy was found to be poison bran mash, prepared according to the usual formula. This is scattered amongst the weeds near to the beet-field, where the beetle is known to be numerous. It feeds greedily on the bait, and is found dead on the ground in abundance next day. The author gives a full life-history of the beetle and the article is accompanied by an excellent plate.
G. W. G.

Spray, Double Purpose. By A. A. Ramsay (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 435–437).—Mixing lead arsenate with soap solution is not advisable, as it renders the mixture dangerous by increasing the solubility of the arsenic. Lead arsenate may be added to Bordeaux or lime sulphur mixture without detriment. These mixtures serve the double purpose of insecticide and fungicide.—*S. E. W.*

Stapelia Gettleffii Pott. By N. E. Brown (*Bot. Mag.* t. 8681).—Nearly allied to *Stapelia hirsuta.* Rudimentary leaves erect at angles of stem. Flowers about 6 inches across, velvety outside, yellowish-green within, the lobes being broadly edged with purple and everywhere else lined transversely with yellow and purple. Native of Transvaal.—*F. J. C.*

Strawberries, Rhizopus Rot in Transit. By N. E. Stevens and R. B. Wilcox (*U.S.A. Dep. Agr., Bull.* 531, pp. 22).—*Rhizopus nigricans* is shown to be the cause of decay of strawberries in transit; a lower temperature is advised in refrigerator cars as the best preventive.—*E. A. Bd.*

Strawberry-growing in the South. By H. C. Thompson (*U.S.A. Dep. Agr., Farm. Bull.* 664, April 30, 1915; figs.).—The strawberry is the most valuable of the small fruit crops grown in the United States. Directions are given on choice of situation, propagation, soil, preparation of soil, fertilizers, planting, mulching, and harvesting, with a list of varieties considered best at the moment, an estimate of the cost of growing strawberries in the South, and a few hints on the utilization of the by-products of the crop.—*M. L. H.*

Strawberry, North American Varieties of. By S. W. Fletcher (*U.S.A. Exp. Stn., Virginia, Bull.* 11, pp. 126; 18 figs.).—A list of 1879 names of varieties with references to literature, origin, and brief descriptions. A valuable feature is the Bibliography at the end, giving a large number of references to North American Strawberry literature.—*E. A. Bd.*

Sweet Corn. By H. Wenholz (*Agr. Gaz. N.S.W.* vol. xxviii., pp. 384–390).—Sweet corn is a distinct type of maize and is less hardy than ordinary maize.

It should be planted in shallow furrows, in a deep, sandy loam enriched with stable manure, on a sunny situation. Superphosphate is applied in the drills at the time of planting, at the rate of 1 or 2 cwt. per acre. The ground must be kept free from weeds, and the surface of the soil must be frequently broken up. It is an advantage to remove the suckers and use them for fodder. The ears are removed when ripe, and the stalks are used as food for cattle. The best varieties of sweet corn are: 'Golden Bantam,' 'Peep of Day,' 'Early Darling,' 'Cosmopolitan,' 'White Evergreen,' 'Stowell's Evergreen,' and 'Country Gentleman.'—*S. E. W.*

Sulphur-Arsenate of Lead Dust, Further Trial of, against the Strawberry Weevil. By Thomas J. Headlee (*Jour. Econ. Entom.* x., pp. 287–290; April 1917).—Good results were obtained by the use of sulphur and lead arsenate in equal parts, and in the proportion of 1 to 5 in reducing the damage done by a strawberry weevil (*Anthonomus signatus* Say). It is recommended that a rather complete coating of the buds should be given with the 1 to 5 strength, as this is the cheaper: preferably by means of power machinery.

The protective action is said to be largely due to a repellent effect. Two dustings gave an increase in crop of about 200 per cent. over the control plot. *G. W. G.*

Sun-Scald of Fruit Trees. By A. J. Mix (*U.S.A. Exp. Stn., Cornell, Bull.* 382, Oct. 1916; figs.).—Apple trees show, as the result of sun-scald, injury to bark, cambium, and outer sapwood on the south-west side of the tree. The injury is probably due to direct freezing to death of the tissue. It is usually brought about in late winter and is not the result of incomplete ripening of tissues. Whitewashing the trunks in autumn or early winter is recommended as a preventive.—*F. J. C.*

Tarnished Plant Bug (*Lygus pratensis*), **Further Experiments in the Control of.** By M. D. Leonard (*Jour. Econ. Entom.*, 8, pp. 361–367; June 1915).—Attempts were made to reduce the number of individuals of *Lygus pratensis*, which invaded a bed of peaches for budding by surrounding it with a close-meshed wire netting six feet high, having a band of Tangle-foot grease four inches deep near the top. The number was reduced but not sufficiently to protect the trees or to pay for the trouble. It is, however, assumed that all the insects captured came from outside the cage, which enclosed 13 acres. The puncturing of the terminal shoot of the tree by the bug damages it so severely that none of the pruning methods of control served to recover the trees.—*F. J. C.*

Telopea oreades Muell. By O. Stapf (*Bot. Mag.* t. 8684; Nov. 1916).—*Proteaceae* (*Embothrieae*). Native of Victoria and New South Wales, and hardy in south-west Cornwall, where it flowered in 1915 in Rev. A. Boscawen's garden. Leaves linear oblong, 6 to 8 inches long. Flowers in capitulate racemes, crimson, about one inch in length.—*F. J. C.*

Thuranthos macranthum. By C. H. Wright (*Bot. Mag.* t. 8680).—*Liliaceae* (*Scilleae*). Allied to Ornithogalum. Collected by Canon and Miss Mason in Tembuland; flowered at Cambridge, 1913. Flowers variable, red-brown, yellow-green, or brown with a red band, petals banded with green, borne on an erect scape, 3½ to 6 feet long.—*F. J. C.*

Timber Shortage Conditions in the Eastern and Southern States with Reference to Decay Problems. By C. H. Humphreys (*U.S.A. Dep. Agr. Bull.*, May 17, 1917).—As a preliminary to an investigation into the prevalence of decay in building timbers, with the prime object of securing some basis for the effective control of such losses, a field study covering about seven months' active work was undertaken during 1914 to determine the conditions under which lumber and structural timbers are stored, for timber infected with wood-destroying fungi during storage may be the direct cause of outbreaks of rot in buildings when such timber is placed in situations favourable to decay.

Decay in timber is almost exclusively due to the action of fungi, the greater part of the destruction being referable to one of the higher groups of these organisms, namely, the Hymenomycetes. In the life circle of these fungi there are two distinct phases of development: (1) the vegetable stage (mycelium), and (2) the fruiting stage.

There are two general methods by which wood-destroying fungi spread from infected to sound timber: (1) By a direct overgrowth of mycelium from an infected stick to adjoining or near-by timber, and (2) by the blowing about of spores produced by the fruit bodies or by the mycelium.

The preservative treatment of timber involves no heavy expenditures for apparatus, especially in connexion with the simpler methods of treatment. The kyanizing process consists merely in the immersion of the timber in an open wood or concrete tank containing a solution of mercuric chloride. Any of the other water-soluble salts could be applied in the same way. Creosotes and carbolineums can also be applied in this manner.

Strong efforts should be made to store the product on well-drained ground, removed from the possible dangers of floods, high tides, and standing water.

More attention should be given to the foundations of lumber piles in order to ensure freedom from decay and better ventilation beneath the stacks. In humid regions the stock should not be piled less than 18 to 24 inches from the ground. Wood blocking used in direct contact with wet ground should be protected by the application of creosote or other antiseptic oils or else replaced by concrete, brick, or other durable materials. Treated horizontal skid timbers would also be highly advantageous, for stock should never be piled in direct contact with diseased timber.—*A. D. W.*

Tobacco, Mosaic Disease. By H. A. Allard (*Jour. Agr. Res.* x. pp. 615–631, Sept. 1917; figs.).—The virus of mosaic disease may be transmitted by rubbing healthy after touching affected foliage, but washing the hands with soap and water removes the virus. It appears to travel from place to place in the plant independently of the veins. The chief agents in spreading it appear to be aphides, such as *Myzus persicae* and *Macrosiphum tabaci*, but *M. lactucae*, red spider, and white fly did not, apparently, carry it. The virus affects *Nicotiana glauca*, but does not produce marked symptoms upon that species. Tobacco may, however, be readily infected from inoculated plants of *Nicotiana glauca.*—*F. J. C.*

Tomato Damping Off and Collar Rot. By G. T. Spinks (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—The disease was found to be associated with a species of *Phytophthora*, and to be controllable by sterilization of the soil.—*F. J. C.*

Tomato Leaf-Spot Control. By F. J. Pritchard and W. B. Clark (*U.S.A. Dep. Agr., Bur. Pl. Ind., Cir.* 4, June 1918, 4 pp.).—This blight of the tomato is a troublesome disease, causing loss of many million dollars in the Mississippi Valley and Atlantic States. The disease forms small circular spots with grey centres, and with dark-coloured margins. For control, Bordeaux mixture of 4, 2, 3, 30 strength is suggested, and having a composition of copper sulphate, quicklime, resin, fish-oil soap, and water.—*A. B.*

Tree-banding Material for the Control of the Gipsy-Moth, A New. By A. F. Burgess and E. L. Griffin (*Jour. Econ. Entom.* x., pp. 131–135; Feb. 1917).—The formula given in this paper is based largely on an analysis of Raupenleim, which is a tree-banding material that has been successful against Gipsy-moth in the German forests. The instrument used for applying it direct on to the tree consists of a cylindrical container having a small rectangular orifice in one end. The banding material is forced from the container by a plunger operated by a kind of cantilever movement. The fingers of the operator's right hand pass through a part of the apparatus not unlike large garden scissors, by means of which the necessary pressure on the plunger is obtained. (An excellent plate shows the instrument in use, and it appears to be a great improvement on the usual method employed in this country.) The sample of tree-banding material which gave the best results consisted of:

(1) A high boiling neutral coal-tar oil (density about 1·15 at 20° C.).
(2) A soft coal-tar pitch.
(3) Rosin oil of the grade known in America as first-run "kidney oil."
(4) Ordinary commercial quicklime.

A stock mixture was made up by transferring a weighed quantity of coal-tar pitch to a ten gallon steam-jacketed kettle. This was heated until thin enough to run, when twice its weight of coal-tar neutral oil was stirred in. This will be referred to as "pitch-neutral oil mixture." The quicklime was slaked so as to make a dry powder and passed through a sieve having ten meshes to the inch.

The tree-banding material may be mixed as follows:—

5 lb. of the "pitch-neutral oil mixture," 16 lb. coal-tar neutral oil and 4 lb. slaked lime were weighed into the steam-jacketed kettle and a mechanical stirrer started. When the contents were of a uniform consistency 20 lb. of rosin oil was added. and ten minutes later 10 lb. more of the coal-tar neutral oil. Fifteen

minutes later the stirring was stopped, and the material left for two days, in which time it sets to a semi-solid cake. A further 2 lb. of coal-tar neutral oil was subsequently stirred into each 50 lb. of the mixture in order to give it the desired oily surface. It is said to be considerably cheaper than any other successful banding material at present obtainable. The bands remain on the trees during the winter and can be moistened with turpentine in the spring so that they will be effective for two seasons.—*G. W. G.*

Trollius. By S. Mottet (*Rev. Hort.* vol. xc. pp. 102–103; 1 col. plate).—*Trollius Ledebouri* has been recently re-introduced into cultivation. It is of erect habit with branching stems. The flowers are remarkable for their warm orange colour and their crown of long petals. It is of easy cultivation.

T. pumilus var. *yunnanensis* bears large yellow flowers resembling a Ranunculus. It likes a light rich soil in a half-shady position.—*S. E. W.*

Turnips, A Colletotrichum Leaf-spot of. By B. B. Higgins (*Jour. Agr. Res.* x., pp. 157–162; July 1917; figs.).—*Colletotrichum Higginsianum* (Saccardo) attacks turnip foliage, stems, and seed-pods, producing small circular straw-coloured spots upon them. It was not found to be carried in the seed as are *C. Lindemuthianum* in beans and *C. Gossypii* in cotton.—*F. J. C.*

Vegetables, Tests with Nitrate of Soda in the Production of Early. By J. W. Lloyd (*U.S.A. Exp. Stn., Ill., Bull.* 184, Nov. 1915).—The use of nitrate of soda as a fertilizer for early crops of vegetables is recommended.

Bi-weekly application to cabbage, cauliflower, spinach, radishes, turnips, and beets proved profitable, but not to onions and lettuce.—*C. P. C.*

Vine, A Non-Parasitic Malady of the. By F. E. Gladwin (*U.S.A. Exp. Stn New York, Bull.* 449, pp. 97–110, March 1918; 3 plates).—The malady first made its appearance in the summer of 1910 and was supposed to be chlorosis, but later observations disclosed their dissimilarity, for it shows itself on light soils during drought and on heavy soils when excessively wet. The first indications show a bleaching between the bundles, which afterwards turn yellow and the whole leaf is soon affected. This checks the growth of the vine, and the fruit does not form satisfactorily. Soils deficient in organic matter are often associated with this malady, and younger vines are more often affected than older ones. Sulphate of iron—the general measure of control for chlorosis in Europe—fails to lessen the affection. The only cure is the addition of considerable amounts of organic matter to the soil. Stable manure and green manuring are both useful in this connexion.—*A. B.*

Vine, Little-leaf of the. By F. T. Bioletti and Léon Bonnet (*Jour. Agr. Res.* viii. p. 381; March 6, 1917; figs.).—This disease, said to vie in seriousness with Phylloxera and Oidium, and confined to sandy soil in California, is characterized by small, yellowish leaves, short-jointed canes, and, in several cases, dead spots on the leaves and gummy secretions in the conducting tissues. In severe cases the vines die after a few years, in slight cases the fruit is set imperfectly. No specific organism has been found connected with the disease, and local soil conditions are suspected as the cause. No cure has yet been discovered.—*F. J. C.*

Walnut Blight in Eastern United States. By S. M. McMurran (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 611, Dec. 1917, pp. 1–8; 2 plates).—Walnut Blight or Bacteriosis is distributed generally throughout the Eastern States. During the summer of 1916 pure cultures of the causal organism were obtained from naturally infected nuts; inoculation experiments were conducted in healthy nuts and twigs, and uniformly produced the disease. From the observations of the author, it is stated that late infections were the rule in 1916. The micro-organism causing the disease is now known as *Bacterium juglandis* (Pierce) Erw. Smith.

Extensive experiments to control this disease by spraying have been conducted from time to time in California, but the results have never been entirely satisfactory. The apparent means of control is the production of immune or highly resistant varieties, and wide planting of small numbers of trees is suggested.
A. B.

War-Time Flowers. By R. M. Pollock (*Irish Gard.* xiii., March 1918, pp. 41–42; 1 fig.).—A useful but brief contribution enumerating a number of

flowers deemed suitable for war-time. We notice that one of the best of all war-time flowers (*Calendula grandiflora* ' Prince of Orange ') is omitted.
E. T. E.

Wasp Enticer. By Pennick Jones (*Gard.* June 16, 1917, p. 220).—*Pyrus erythrocarpus* in bloom in June exercises a peculiar fascination to queen wasps, and the author states he had captured many scores on a bed of these plants, and it should be tried in every garden for this purpose. The plant is also very attractive, with its glossy leafage and striking autumnal tints. The showy black sheeny berries borne till winter enhance its merits.—*H. R. D.*

Water-lilies, Leaf-spot of. By F. V. Rand (*Jour. Agr. Res.* viii. pp. 219–232, February 1917; figs.).—The disease appears first as tiny black specks on the leaf blade, often reddish or bordered with red. Later the entire leaf may become a dark greenish black mass of tissue that falls apart on the slightest touch. The causal fungus was isolated from the leaves of *Nymphaea odorata* and proves to be a new species, which is named *Helicosporium nymphaearum*.—*F. J. C.*

Water-Melon Diseases. By W. A. Orton (*U.S.A. Dep. Agr., Farm. Bull.* 821, May 1917; 11 figs.).—This bulletin gives a popular account of the commoner diseases of the water-melon, including "Wilt," caused by *Fusarium niveum* Erw. Sm.; "Root-knot," caused by nematode *Heterodera radicicola* (Greef) Müller; Anthracnose, caused by *Colletotrichum lagenarium* (Pass.) Ell. and Halst.; Stem End Rot, caused by *Diplodia* sp.; Stem Blight, caused by *Mycosphaerella citrullina* (Sm.) Gr.; Bacterial Wilt, caused by *Bacillus tracheiphilus* (Erw. Sm.); and Downy Mildew, caused by *Peronoplasmopara cubensis* (B. and C.) Clint. Control measures are suggested for the various diseases.—*A. B.*

Watering at Midday. By C. Rivière (*Rev. Hort.* vol. xc. pp. 86–87).—Experiments show that when cultivated soil exposed to the sun at midday is watered, only a fall of 6° F. is observed at a depth of 4 inches. This is not sufficient to check the growth of a plant. The effect is much greater in an untilled soil, or in pots. When a plant flags, water it whatever the temperature may be.
S. E. W.

Water in a Soil, Relation of Movement to Hygroscopicity and Initial Moistness. By F. J. Alway and G. R. McDole (*Jour. Agr. Res.* x. pp. 391–428; Aug. 1917).—The downward movement of water and rate of penetration under various conditions of moisture and composition are dealt with. Comparisons are made with the rate and height of capillary rise, and they are found not to coincide with rate and depth of penetration in the same soil.—*F. J. C.*

Weeds, Effect on Crops. By Dr. Winifred Brenchley (*Jour. Bd. Agr.* vol. xxix. No. 12 March 1918).—Gives results of some experiments undertaken at Rothamstead to test the amount of harm wrought by weeds on crops. The conclusion came to was that "the essential factor in the relation of crop with weed is that of competition for food, space, and light rather than that of the toxic excreta from roots." There was no evidence of any poisonous secretion from the roots, although other investigators have reached different conclusions. In connexion with the competition for food, space, and light, it was proved that thickly sown wheat made less growth, plant for plant, than thinly sown wheat in the presence of weed, indicating that the competitive action of wheat with itself was stronger than that of the weeds.—*G. C. G.*

Weeds: How to Control them. By H. R. Cox (*U.S.A. Dep. Agr., Farm. Bull.* 660, May 12, 1915; pl.).—Three injunctions are laid upon the farmer which will remove the need for much of this work of weed destruction by removing the cause of weed growth:—

(1) Prevent weeds from going to seed.
(2) Prevent weed seed from being brought to the farm.
(3) Prevent perennial weeds from making top growth, and so starve out the underground parts.

This bulletin is divided into sections dealing with each of these stages in the extinction of weeds, and gives a list of the fifty worst weeds in the United States, with their characters, duration of life, a short description of each, and where and under what conditions they do most mischief.—*M. L. H.*

Weeds of New South Wales. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 409–416 and 563–570; xxix. pp. 31–37; 5 plates).—Blue Weed (*Echium*

Plantagineum), St. John's Wort (*Hypericum perforatum*), the True Star Thistle (*Centaurea Calcitrapa*), and Cockspur (*C. melitensis*) are spreading fast in New South Wales and threaten to become dangerous pests. The Thorn Apple or False Castor-oil Plant (*Datura Stramonium*) is widely distributed in New South Wales. Owing to the poisonous nature of the seed, every attempt should be made to eradicate it. The Wild Onion (*Allium fragrans*) threatens to be a serious pest.—*S. E. W.*

White Grubs and May-beetles (*Lachnosterna*), **A Chemical Feeding Analysis of, and its Economic Application.** By John J. Davis (*Jour. Econ. Entom.* x., pp. 41–44; Feb. 1917).—The American practice of feeding off standing corn to pigs is shown to be a good one. Their liking for white grubs and caterpillars is well known, and may profitably be taken advantage of for the destruction of soil-inhabiting pests in fields and pastures. Figures are given of the feeding value of *Lachnosterna* and *Melolontha* adults and larvæ, and also for the value of the manure produced. Objections to the use of pigs in grub-infested ground are dealt with, and the advantages summarized are (1) Eradication of grubs which might otherwise destroy the crops planted on the ground; (2) Value of the grubs as pig-feed, which is comparable with feeds costing 25 to 35 dollars per ton; (3) Value of the manure distributed over the land which, according to the experts of the Federal Bureau of Animal Industry, is worth 3·29 dollars a ton. It should be noted that the white grub-infested areas are said to average 106,680 grubs or 235 pounds of grubs to the acre, which have a food value of more than three dollars.—*G. W. G.*

Winter, Plants and the. Anon. (*Irish Gard.* xii., Oct. 1917, pp. 150–151).—A list of the choicer plants which came through the winter of 1916–17 at the Royal Gardens, Glasnevin, Dublin. It is of considerable value to those who are making new collections of hardy plants, or renovating old collections.—*E. T. E.*

Winter, The Severe: its Effect on Some of the Newer Plants and Shrubs. By George Dillistone (*Gard.*, p. 107, March 31, 1917; and p. 115, April 7, 1917).—For comparison a few of the well-known shrubs that have suffered may be mentioned. The Escallonias appear the worst, the best of which are bad. Every leaf on *E. macrantha*, *E. exoniensis*, *E. Ingramii*, and *E. langleyensis* is brown, and the later autumn growths affected. *Choisya ternata* has suffered severely, and all the Ceanothuses more or less. *Rosmarinus officinalis*, *Hypericum calycinum* (Rose of Sharon) and *Cotoneaster microphylla* look sick and miserable.

Of the Chinese Primulas, especially those collected by Forrest 1913–16, *P. conica* is evidently an absolutely safe plant; so are *P. nutans*, *P. secundiflora*, and *P. vincaeflora*. *P. helodoxa* is quite a success, no plant in the open having suffered, but the foliage of a few wintering in a cold frame turned dark, afterwards recovering. *P. pulchella* is the only new primrose claimed as hardy which is not going to prove of much use in the garden. *P. membranifolia*, *P. spicata*, and *P. vittata*, though not so severely tried, have come through well, also *Aster staticifolius*, *Salvia digitaloides*, and *Saxifraga Delavayi*, other new plants collected by Forrest. In the Berberises the evergreen varieties have suffered most, and the larger the leaf the more it is affected. This is also the case with the Cotoneasters. Unscathed are *Berberis Wilsonae*, *B. subcaulialata*, *B. aggregata*, and among the evergreens *B. Sargentiana* and *B. brevipaniculata*, *B. candidula*, *B. Gagnepainii*, and *B. verruculosa*. Those showing signs of distress are *B. Knightii*, *B. pruinosa*, all the *stenophylla* hybrids, *diversifolia*, *erecta*, *Irwinii*, *latifolia*, and *reflexa*.

Three Cotoneasters unaffected are *C. adpressa*, *C. applanata*, and *C. pannosa*, but *C. humifusa* was badly treated by the wind. *C. congesta* and *C. pyrenaica* suffered in a less degree, while the older *C. microphylla* and *C. thymifolia* lost most of their leaves.

Of the Cytisuses *C. Beanii* and *C. Dallimorei* have stood with impunity. *Davidia involucrata* has survived without harm. *Erica arborea*, *E. lusitanica* (*codonodes*), and *E. Veitchii*, thought to be of doubtful hardiness, have come through practically untouched. *Hypericum empetrifolium* has nearly succumbed, but *Ligustrum Delavayanum* and *L. Henryi* have proved safe plants, so has *Lonicera nitida*.

The Olearias *macrodonta*, *moschata*, and *stellulata* are untouched, but *Ozothamnus rosmarinifolius* and *Rhamnus Perrieri* resent the keen wind. *Sarcococca ruscifolia* is unaffected, but *Stransvaesia undulata* has suffered, and *Veronica diosmaefolia* looks very bad. The Viburnums *Carlesii*, *dilatatum*, *Henryi*, *macrocephalum*, *plicatum*, and *rhytidophyllum* are unharmed.

These observations were made at Colchester.—*H. R. D.*

Wireworm Trapping. By E. H. Jenkins (*Gard.* May 19, 1917, p. 172).—Sliced carrots and potatos were found of doubtful value, many more wireworms being found in the potato tubers not intended for them than in the prepared bits that were. The most effectual trap known to the author is a young Chrysanthemum. On soil treated with a soil-fumigant four times above the prescribed strength, young Chrysanthemums were planted with a view to getting a crop of flowers later. Instead he got one of wireworms, a dozen to a score on many plants. The crop of Chrysanthemums did more to rid the ground of the pest than anything. The Chrysanthemums will not interfere with the potatos.

(*Gard.* June 2, 1917, p. 195).—Mr. Ernest A. White, Coollegrean, Waterford, finds a good dressing of salt mixed with soot the best remedy.—*H. R. D.*

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 16, 1917.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (51).—Mrs. Aubrey-Fletcher, W. Baker, M.A., LL.B., J. A. Barnes, Mrs. F. J. Harvey Bateman, G. Bennett, Mrs. Bowden, James Brown, Hon. Mrs. F. C. Brownlow, Mrs. Burnaby-Atkins, Miss E. M. Clarke, A. L. Cotton, Mrs. M. Crofton, F. C. Dalgarno, Miss M. E. Edmonds, Herbert Evans, Mrs. A. S. Fleming, Miss L. M. Fowler, E. E. Green, Miss G. E. A. Gurdon-Rebow, Mrs. S. Hancock, Miss C. Harding, G. C. Hodgson, Miss E. L. Howl, Elisha Hulme, E. R. Janes, T. B. B. Ker, Mrs. G. Kinnaird, E. A. Lundy, T. P. P. McPhail, Miss E. L. Matthews, W. Morgan, W. E. Odlum, Lady Owen-MacKenzie, W. Player, Miss A. M. Pollard, Mrs. M. Prothero, A. D. Rawlings, Lady Royds, Major T. G. A. B. Sabine, Audrey B. Skimming, Joseph Smith, A. P. Street, T. Tongue, Cecil J. Webb, Mrs. E. H. Weller-Poley, Miss S. J. Welsh, M.B., Mrs. Arminel Werring, Mrs. H. S. Whitmore, Mrs. J. Wilkinson, H. Wallis Wood, Thomas Woolley.

Fellows resident abroad (2).—W. S. Johnston (New Zealand), Isaac Tribolet (South Africa).

Associates (5).—Miss K. A. Clarke, G. Fenton, J. G. Hagan, Miss M. Walden, Albert Webb.

Affiliated Society (1).—Wakefield Paxton Society.

GENERAL MEETING.

JANUARY 30, 1917.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (23).—Mrs. C. G. Anson, E. C. Bumpstead, Mrs. Campbell, Mrs. A. H. Cohen, W. N. Cosgrave, W. J. Crampton, W. Dandie, G. W. Garlick, W. R. Hillier, G. C. Howe, Miss F. E. Jones,

W. MacSweeney, C. W. Moore, E. Pickering, L. A. M. Riley, R. C. S. Ross, Thomas Ryan, T. A. E. Sanderson, M.A., K. M. Allan Smith, Mrs. F. Speyer, A. Taylor, R. W. Thorne, Mrs. R. Worsley.

Associates (2).—Miss M. L. Despard, D. W. Simmons.

ANNUAL GENERAL MEETING.

FEBRUARY 13, 1917.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (18).—Mrs. Berners, E. B. Bothwell, Miss Cook, A. Day, Mrs. C. W. Dunn, E. O. Griffiths, Miss D. Mainwaring, A. F. May, Mrs. A. F. May, Capt. T. W. C. Nevill, Miss C. Procter, Mrs. E. Pullar, Jesse Pye, W. Sherwood, Miss Swinscow, Miss E. M. Taylor, J. M. Williams, Mrs. Wills.

Associate (1).—Henrietta C. Tuke.

The CHAIRMAN moved the adoption of the Annual Report. This was seconded by Dr. KEEBLE, who briefly spoke upon the various items of War work being done by the Society, more particularly that of increased vegetable food production and the despatch of seeds to our base hospitals and camps in France and Salonika. The report was then carried.

The following names of President, Vice-Presidents, Members of the Council, and Officers having been duly proposed and seconded, and the list sent round in accordance with Bye-law 74, and no alternative name having been proposed, they were declared by the Chairman to be elected:

As President.—Field-Marshal the Right Hon. Lord Grenfell, G.C.B., G.C.M.G.

As Vice-Presidents.—The Duke of Bedford, K.G., F.R.S., the Rt. Hon. the Earl of Ducie, F.R.S., Leopold de Rothschild, Esq., C.V.O., Sir John T. Dillwyn-Llewelyn, Bt., D.L., J.P., V.M.H., the Duke of Portland, K.G., P.C., G.C.V.O., the Rt. Hon. James W. Lowther, P.C., Sir Daniel Morris, K.C.M.G., V.M.H.

As Members of Council.—Mr. W. A. Bilney, J.P., Lieut.-Col. Sir David Prain, C.I.E., F.R.S., V.M.H., Sir Harry J. Veitch, V.M.H.

As Treasurer.—Capt. and Hon. Major C. G. A. Nix.

As Secretary.—The Rev. W. Wilks, M.A., V.M.H.

As Auditor.—Mr. Alfred C. Harper.

V.M.H. Medals were handed to the following:

Mr. E. A. Bowles, M.A., F.L.S., the Hon. Vicary Gibbs, and Messrs. W. Slocock, Peter C. M. Veitch, and W. Watson.

The Rev. JOSEPH JACOB suggested that the time had come when the Charter of the Society should again undergo revision, so that the

Annual Meeting could be held at a later period in the year. He also said that he considered the small expenditure on the Library was a matter for regret, as it already compared badly with the Horticultural Libraries of Paris and Boston.

Mr. OAKS, of Southampton, also spoke on the subject of the Library, and expressed the hope that the Library might be more fully developed. As regards the revision of the Charter, he suggested that this was not the proper time to take up this matter because of the cost it would involve.

Mr. BOWLES explained that the present time was far from favourable for the purchase of valuable books for the Library, because of the inflated prices they were fetching in America, where the money of the whole world seemed to be concentrating.

Mr. WALLACE introduced the question of the Society's funds being invested in the New War Loan, and proposed the following Resolution:

> "That in the opinion of this General Meeting the Council will be well advised to increase the Society's investment from £10,000 to £20,000 in War Loan in view of the Society's strong financial position."

This was seconded by Miss COLT.

Mr. OAKS suggested as an amendment that the amount to be subscribed be left to the discretion of the Council. This was seconded by Miss BRYAN.

On the amendment being put to the Meeting it was lost by 16 votes to 27.

The CHAIRMAN then put the original motion, which was carried.

Mr. GERALD LODER proposed a vote of thanks to the Chairman, which was carried with acclamation.

REPORT OF THE COUNCIL FOR THE YEAR 1916.

1. **The Year 1916.**—With the single exception of 1887–8, which may be called "The year of the Society's Reconstruction," there has probably never been a year of such continued anxiety, strain, and stress, as the one now just ended; and though the twelvemonth is ended, the strain and stress bid fair to continue. The Council have had most difficult matters to decide, and have had constant deliberations as to how best to meet, and promote, all reasonable national interests, without altogether sacrificing the position of the Society (itself an asset of the National welfare) with the safeguarding of which they are specially charged.

At the first outbreak of the War the Council decided on the general line of policy which the Society ought to adopt, viz. to place itself, its resources, and its buildings in every possible way at the disposal of the Government for national military requirements, and to endeavour to increase to the utmost the general supply of fruit and vegetable food-products of the whole country—and this policy they have kept ever in view.

2. **Increase of Garden Produce.**—It will be remembered that on the very first day of the War the Society sent a letter to the Press pointing out the urgent necessity for increasing the fruit and vegetable produce of the country. This was followed by the free issue of 100,000 leaflets containing directions how this could best be done so as to yield an immediate result during the following winter. At the same time a Central Bureau was established at Vincent Square for the collection and distribution of seedling vegetable plants, which the Society sent out to a number not far, if at all, short of a million. These preliminary efforts being well started, the Society next prepared a series of War Pamphlets, dealing *inter alia* (1) with the most efficient means for cropping gardens, (2) economy both in labour and material, (3) the preservation of produce, and (4) utilizing it to the best purpose. Sixteen of these Pamphlets were drawn up, and 90,000 of them have already been issued *; and of the Gardeners' Diary for 1916—specially designed to meet War-time needs—no less than 50,000 have been sent out. These figures are some indication of how important and far-reaching the influence of the Society is.

These efforts, strictly within the province of the Society, were followed by strong and urgent representations to the Government to grant power to Local Authorities, under the Defence of the Realm Act,

* Five further Pamphlets are now ready or in the Press, viz.:—The Cultivation and Manuring of the Kitchen Garden, The Potato as a Garden Crop, Fruits under Glass in War Time, The Pruning of Hardy Shrubs, The Children's Garden.

to put waste lands under cultivation, and to defray the necessary expenditure upon it; the influence of which representations may be traced in the Order in Council published on December 8 granting to the Board of Agriculture the very points for which the representatives of the Society had so urgently pleaded.

3. **The Hall.**—It will be remembered that in 1914 the Society voluntarily gave up its Hall for the use of the Westminster Dragoons who occupied it for several months, when it was again returned to the Society. The next request for its use was made on behalf of the Australian Imperial Force, in the early part of July—a request which, in accordance with the Council's policy, was without hesitation agreed to—but owing to unforeseen difficulties at the War Office the Australians were not able to move in until the last month of the year.

4. **Temporary Premises.**—Owing to the occupation of our own Hall by the Australians, the War Office, recognizing the National importance of the Society's work, have secured for our fortnightly Meetings the use of the London Scottish Drill Hall in Buckingham Gate, Victoria Street, just opposite the Army and Navy Stores—the same Hall in which our Meetings were held from 1888 to 1904. The Offices of the Society and the Library will remain at Vincent Square as heretofore.

5. **British Base Hospital and Camp Gardens in France.**—At the commencement of the year, large quantities of plants and seeds were purchased and sent out to the British Base Hospitals and Camps in France for planting there. Many expressions of appreciation have reached Vincent Square, including an extract from a note on a visit to France by Sir James Kingston Fowler, K.C.V O., saying how well furnished these gardens were, largely as the result of the plants and seeds supplied by the Society.

The following is from one of many other letters received from the War areas: " May I express my deep gratitude, and that of the officers of this camp, for the splendid gift of fruit and vegetable seeds sent by the R.H.S. and received here to-day? It is difficult to tell you how very much your generosity is appreciated, more especially as we know what large calls have already been made upon it. Your unexpectedly kind response to my appeal will be the means of giving pleasure to hundreds of convalescents during the summer and autumn. With renewed thanks, I am, ——."

The Council particularly desire to thank Messrs. Hurst, Mr. Slocock, and Mr. Jackman, amongst others, by whose generous assistance, coupled with that of our own gardens at Wisley, more than 10,000 plants and many thousands of packets of seeds have been sent out.

6. **Vegetable Seeds to the Troops in Salonika.**—In consequence of representations made to the Society, steps were taken in 1915 for rendering immediate relief to the horticulturists of Serbia. Acting in

co-operation with the Royal Agricultural Society. and on the advice of an Agent who was sent out by the two Societies jointly to report upon the conditions and needs of that country, a large consignment of seeds was despatched before it was suspected that Serbia would again be overrun. As a result of the change which afterwards arose in the military position, the seeds were stopped at Salonika and distributed amongst the British and French troops stationed there and at Malta, so that they were turned to good and profitable national use.

7. **Laying Out Cemeteries in France.**—The Council have received, and accepted, an invitation to co-operate, when the time comes, with the Committee, of which H.R.H. the Prince of Wales is President, for laying out and planting the cemeteries in France where the bodies of so many of our brave fellow-countrymen lie.

8. **"Star and Garter" Hostel.**—The Council have also offered to plant the garden of the "Star and Garter" Hostel at Richmond for Officers incurably wounded, which offer having been accepted they will proceed with the work as soon as the site is ready. The work will be rendered less onerous from the offer of plants by Mr. Leopold Rothschild and others.

9. **Red Cross Sale.**—In June a Sale of Plants, &c., was held by the Society at Vincent Square. Fellows and their friends were invited to contribute plants and horticultural books, pictures, and sundries. The response was so generous that the Sale, which was originally intended to occupy two days, had to be extended to three to enable the Auctioneer to get through the catalogue of nearly 3,000 lots. Messrs. Prothero & Morris most kindly gave their services as auctioneers, Mr. Byam Shaw designed the very attractive cover of the catalogue, and Sir Owen Seaman wrote the dedicatory verses. Mr. Bradbury of the Whitefriars Press also gave generous assistance by charging only the actual net cost price of the printing. These combined efforts produced a really remarkable catalogue which contributed in no small degree to the general result, namely, that £2,203 has been handed to the Red Cross Society. The Council extend their warmest thanks to all who so readily co-operated to make a most difficult sale the great success which it achieved.

10. **Other Items of War Work.**—Among other items of work bearing upon the War which the Society has taken in hand are the following:

(1) Many large cases of bulbs and seeds, collected from the Fellows and friends of the Society, have been sent to the English Prisoners' Camp at Ruhleben.

(2) Offer of co-operation with the Government in the Land Development Scheme, and giving cognate facilities at Wisley.

(3) Offer of training in Horticulture to disabled Officers.

(4) Offer of expert advice to Local Authorities on the growing of vegetables on unoccupied lands.

11. **Staff Enlisted.**—There has been a further response on the part of the Society to the call for men. The total number from our Staff and Students (past and present) serving is 118, of whom five have laid down their lives for their country. Two, Capt. Ferris Grant and Lieut. J. C. Powell, have been awarded the Military Cross, whilst Sergt. H. W. Abbis has won the Distinguished Conduct Medal. Capt. Page, the Society's Chemist at Wisley, was severely wounded, but is now making a satisfactory recovery.

12. **War Relief Fund.**—On December 31 the total amount received and promised for our War Relief Fund amounted to over £14,000. The increase during the twelve months has been almost entirely due to the hard work and unflagging zeal of Lady Northcote, C.I., President of the Ladies' Committee, the Vice-Presidents, the ladies of the Committee, and the County Presidents. Their patient and untiring efforts have brought about a result which ought to be as gratifying to themselves as it is to the Council. By the holding of garden fêtes, meetings, entertainments, and such-like, considerable sums have been collected. Whilst it would be invidious to mention particular names where all have worked so energetically, the Council desires to make two exceptions and to specially thank Lady Northcote for her extraordinary zeal in the cause, and Mrs. Lowther for the highly successful meeting held at the Speaker's House on May 24. During 1917 the work of the Ladies' Committee will be continued. A List of Subscriptions accompanies this Report [not reproduced here].

13. **The Laboratory at Wisley.**—The magnificent laboratories at Wisley have been completed during the year (see *R.H.S. Journal*, vol. xlii., pt. 1), and work, with such staff as is available, has commenced. During the year the following problems, among others, have been under investigation:

(1) The so-called Fusarium disease of Narcissi, by Mr. J. K. Ramsbottom (Research Student).

(2) The control of American Gooseberry Mildew, and the effect of Burgundy mixture in preventing the summer stage of the disease on the berries, by Dr. A. S. Horne.

(3) Rose Mildew and Apple Fruit Spot, by Dr. A. S. Horne.

(4) The effect of electrical discharge on the yield of market garden crops, by Mr. F. J. Chittenden, F.L.S., in collaboration with the Imperial College of Science and the Board of Agriculture.

(5) Problems connected with pollination in orchards, and with the fruiting and growth of fruit-trees, by Mr. F. J. Chittenden, F.L.S.

(6) Breeding of hardy peas, by Dr. Keeble, F.R.S.

(7) Breeding of strawberries, blackberries, and other Rubus fruits, by Dr. Keeble, Mr. Wright, and Mr. Wilson.

(8) Breeding of hardy Primulas, by Dr. Keeble and Mr. Blakey.

14. **Board of Scientific Studies.**—The Royal Society having appointed a Board of Scientific Studies, the Council were invited to nominate a representative to serve upon it, and the name of Dr. Frederick Keeble, F.R.S., Director of Wisley, was accordingly given.

15. **Neglect of Science.**—The Society was also asked to send representatives to attend a Meeting called to consider the subject of the "Neglect of Science," and Mr. Arthur W. Sutton, V.M.H., and Dr. Frederick Keeble, F.R.S., were appointed.

16. **Chelsea and Holland House Shows.**—The Chelsea and Holland House Shows were held in somewhat modified form more in accordance with the times. The Council have had great anxiety in coming to a decision whether to hold these two large Shows in 1917, and had at first decided to continue them, but, added to the trouble arising from the shortage of labour, the difficulties of transport, and the Government's desire to reduce travelling to the utmost possible extent, they now find themselves confronted with a further difficulty that at the last moment the Contractor has reported that he cannot guarantee to get up the tents. For all these reasons the Council have decided to abandon these Shows. In arriving at this decision, which has been adopted on patriotic grounds, and after the most careful consideration of all the points both for and against it, the Council hope they will have the support and approval of every Fellow of the Society.

In the place of these two Shows ordinary Fortnightly Meetings will be held at the London Scottish Drill Hall, Buckingham Gate, on the usual fortnightly dates, namely, May 22 and July 3.

17. **Dry Bulb Show.**—In August the first Show of Dry Bulbs which the Society has ever held took place at Vincent Square, and proved a great success. Its object was to call attention to, and encourage, a future British industry. A Conference was held in the afternoon at which the subject of the Bulb Trade was considered.

18. **Tulip Report.**—The report on the Tulip Trials, undertaken before the outbreak of War, has been unavoidably delayed, more particularly through the difficulty of communication between the English and Dutch members of the Committee. The report is, however, now in the Press, and its issue may be expected at an early date. Its price will be 2*s.* 6*d.* post free.

19. **Fruit List.**—The "List of the Most Desirable Varieties of Fruits," drawn up by the Society's Fruit Committee, will also be issued in view of its bearing upon the future fruit interests of the country. It runs into nearly 200 pages, and its price is 2*s.* post free.

20. **Library.**—Further additions to the Lindley Library have been made. The Council particularly wish to thank the Family of the late

Sir Trevor Lawrence, our President, for the munificent gift of 172 volumes from his library.

21. **Treasurer.**—The Council were inexpressibly grieved by their sudden loss in March of Mr. J. Gurney Fowler who for the last eighteen years has been Treasurer of the Society. With what success he handled the Society's finances the annual balance sheets show. And not only in his office of Treasurer was he one of the mainstays of the Society's work, but as Chairman of the Orchid Committee he contributed greatly by his wide knowledge of Orchids to the deliberations of that Committee. The heavy work which fell upon him in connexion with the International Exhibition of 1912, and which no other man could have successfully accomplished, will always be a helpful incentive to those who come after.

Capt. and Hon. Major C. G. A. Nix, Member of Council and Chairman of the Fruit and Vegetable Committee, has accepted the Office of Treasurer as Mr. Gurney Fowler's successor. Major Nix is at present absent on Military duties, and in the interim Sir Harry J. Veitch, V.M.H., is acting Treasurer.

The Council are glad to be able to announce that Sir Jeremiah Colman, Bart., has consented to act as Chairman of the Orchid Committee.

22. **Vases.**—The difficulty of vases being taken away from the Hall, and the many breakages, coupled with the present insuperable difficulty of obtaining new vases, compel the Council, in the interest of exhibitors, to require a deposit at all exhibitions. This deposit will be refunded on the vases being returned to the Show Attendant. It will be necessary, therefore, for exhibitors to provide their assistants with vase money (1*s*. for a dozen or any less number) when sending them to prepare for an Exhibition.

23. **Economies.**—The usual List of Fellows will not be issued for the new year, but only a supplement to last year's list, containing the names of new Fellows. Those Fellows who have any knowledge of the shortage of paper and labour will perceive the necessity for every possible economy in this direction.

For somewhat similar reasons the Daffodil Year Book was not continued this year, but when conditions improve the Council hope to resume its publication.

Other economies include (1) the issue of only two Parts of the Journal instead of three; (2) the withdrawal of most of the Silver Cups from the Award Lists at Chelsea and Holland House—an economy which the exhibitors loyally accepted and for which the Council thank them; (3) the greatly reduced size of the tents at Chelsea and Holland House; and (4) the omission of the Holland House luncheon for the Committees and Judges. Also (5) the use of post-cards for all correspondence not involving personal matters; (6) the omission of Bands

at both the principal Shows ; and, lastly, (7) a much smaller staff and longer working hours.

24. **Gold Medals.**—In order to conform to the desire of the Government that the use of the metal of Gold should be as restricted as possible, the Council have decided not to strike any further Gold Medals until after the War. The Council are assured that the would-be recipients will be patriotically content with the Gold Medal *Card* until easier times may be reached.

25. **Obituary.**—It is with deep regret that the Council have to record the death of many Fellows, particularly the following :—Mr. J. Gurney Fowler previously referred to ; Elizabeth Lady Lawrence, who, with the late Sir Trevor Lawrence, Bart., was for so many years associated with the Society ; The Right Hon. Lord Redesdale, G.C.V.O., C.B., V.M.H., and Mr. N. N. Sherwood, V.M.H., past members of the Council and both important patrons of horticulture ; The Right Hon. Sir C. Clementi-Smith, G.C.M.G., Mr. Edward Mawley, V.M.H., President of the National Rose Society ; Dr. Robert Boxall ; and Messrs. W. Y. Baker, W. F. Cooling, F. G. Drew, F. Enock, R. H. Fremlin, Wm. Wells, John Wright, V.M.H., and George Wythes, V.M.H.

26. **New V.M.H.**—Owing to the death of two holders of the Victoria Medal of Honour quite at the close of 1915, coupled with the loss of others during the current year, the Council have appointed the following gentlemen to this honour, viz. :—Mr. E. A. Bowles, M.A., F.L.S. ; The Hon. Vicary Gibbs ; and Messrs. W. Slocock, Peter C. M. Veitch, and W. Watson.

27. **Numerical Position.**—The following table shows the Society's position with regard to numerical strength during the past year :—

LOSS BY DEATH IN 1916.

		£	s.	d.
Life Fellows	7	0	0	0
4 Guineas	2	8	8	0
2 ,,	60	126	0	0
1 ,,	74	77	14	0
Associate	1	0	10	6
	144	£212	12	6

LOSS BY RESIGNATION, &c.

		£	s	d.
4 Guineas	0	0	0	0
2 ,,	296	621	12	0
1 ,,	415	435	15	0
Associates	13	6	16	6
Affiliated Societies	5	5	5	0
	729	£1,069	8	6
TOTAL LOSS	873	£1,282	1	0

FELLOWS ELECTED IN 1916.

		£	s.	d.
4 Guineas	6	25	4	0
2 ,,	351	737	2	0
1 ,,	424	445	4	0
Associates	47	24	13	6
Affiliated Societies	7	7	7	0
Commutations = £262 10s. od.	12			
	847	£1,239	10	6
Loss		1,282	1	0
NET DECREASE IN INCOME		£42	10	6

Deaths and Resignations	873
New Fellows	847
NUMERICAL LOSS	26
Total on December 31, 1915	13,937
Total on December 31, 1916	13,911

28. **Committees &c.**—The Society owes a constantly recurring debt to the Members of the Standing and Special Committees, Chairmen, Judges, Writers of Papers for the *Journal*, Compilers of Extracts, Reviewers, Lecturers, and the several Examiners, who, during the past twelve months, have done so much to contribute to the Society's national usefulness and to help to maintain its high standing among the practical and scientific institutions of the world.

The Council desire cordially to acknowledge their obligations to their staff and also to the Press for their invaluable assistance in reporting upon, and calling attention to, the work of the Society.

By Order of the Council,

W. WILKS,

Secretary.

ROYAL HORTICULTURAL SOCIETY,
VINCENT SQUARE, WESTMINSTER, S.W.
January 1, 1917.

	£ s. d.	£ s. d.
To ESTABLISHMENT EXPENSES—		
Ground Rent	690 0 0	
Rates and Taxes	642 8 4	
Water Rate	66 4 4	
Electric Light	60 2 11	
Gas	28 12 11	
		1,487 8 6
Salaries and Wages	2,260 12 11	
Printing and Stationery	1,415 16 11	
Postages	656 10 8	
Fuel	52 1 0	
Advertising	125 9 1	
Professional Fees	234 6 4	
Gratuities	70 0 0	
Repairs and Renewals (including £150 for Hall Painting)	323 13 1	
Miscellaneous Expenses	160 14 10	
		5,299 4 10
,, INSURANCES		131 7 5
,, JOURNAL, PRINTING AND POSTAGE		3,067 2 6
,, STAFF PENSION	329 11 9	
Less contributed by the Staff, as per scheme	133 18 9	
		195 13 0
,, SHOWS AND MEETINGS—		
Chelsea Show	1,513 15 8	
Holland Park Show	1,164 2 1	
Autumn Vegetable and Fruit Show	375 3 9	
Labour, Floral Meetings and Conferences	194 11 4	
Expenses, do. do.	46 0 8	
Council, Committee and Deputation Expenses	191 6 6	
Painting Orchid Certificates	28 10 0	
		3,513 10 0
,, INSPECTION OF GARDENS		7 16 4
,, PRIZES and MEDALS—		
Awarded at Society's Shows		268 13 1
,, EXAMINATIONS in HORTICULTURE—		
Amount expended	173 1 3	
Less received in Fees	108 17 6	
		64 3 9
,, CONTRIBUTION to LINDLEY LIBRARY—		
Purchase of Books	135 14 1	
Expenses	56 5 6	
		191 19 7
,, SPECIAL EXPENDITURE—		
Printing List of Certificated Orchids	115 8 0	
Special Circulars to Fellows	126 0 9	
Contribution to Forrest Account	103 18 4	
Trees, Shrubs, &c., sent to the Army in France	139 6 0	
Expenses connected with Red Cross Sale	14 0 0	
		498 13 1
,, DEPRECIATION—		
Hall Glass Roof, Furniture, Appliances for Shows		265 9 4
		14,991 1 5
,, BALANCE, carried to BALANCE SHEET		10,035 3 11
		£25,026 5 4

	£ s. d.	£ s. d.
By Annual Subscriptions		18,748 10 0
" Entrance Fees		143 17 0
" Dividends and Interest	1,876 15 1	
" do. do. Davis Trust	46 16 10	
		1,923 11 11
" Shows and Meetings—		
Chelsea Show	1,779 3 0	
Holland Park Show	663 13 0	
Takings at Hall Shows	87 0 5	
		2,529 16 5
" Journals and Other Publications—		
Advertisements	810 12 8	
Sale of Publications	516 2 6	
		1,326 15 2
" Hall Lettings	179 13 0	
Less Labour Expenses	37 17 2	
		141 15 10
" Prizes and Medals		92 12 0
" Life Compositions— Being amount paid by Fellows now deceased		57 15 0
" Rent of Cottages, Wisley		61 12 0
		£25,026 5 4

Dr. **BALANCE SHEET,**

LIABILITIES.

		£ s. d.	£ s. d.
To CAPITAL FUNDS ACCOUNT—			
As at 31st December, 1915 . . .		46,174 7 0	
Less Fees paid by Fellows now deceased		57 15 0	
			46,116 12 0
,, LIFE COMPOSITIONS, 1916			304 10 0
,, SUNDRY CREDITORS			2,526 9 1
,, SUBSCRIPTIONS, &c., paid in advance . . .			240 1 6
,, WISLEY SCHOLARSHIPS—			
Balance 31st December, 1915.			5 4 2
,, RESERVE ACCOUNT—HALL PAINTING—			
Balance 31st December, 1915.		673 13 4	
Added 1916		150 0 0	
			823 13 4
,, DEPRECIATION AND RENEWALS RESERVE ACCOUNT—			
Balance 31st December, 1915		2,477 2 2	
Added 1916.		265 9 4	
			2,742 11 6
,, LABORATORY PRIZE FUND—			
Balance 31st December, 1915 .	£4 2 11		
Dividend (Nicholson Memorial Fund)	5 16 9		
		9 19 8	
Less expended		5 9 6	
			4 10 2
,, WILLIAMS MEMORIAL FUND			21 10 10
,, MASTERS MEMORIAL FUND			29 4 4
,, SCHRÖDER PENSION			7 11 8
,, LINDLEY LIBRARY TRUST			10 0 0
,, PRITZEL REVISION FUND			88 5 1
,, GENERAL REVENUE ACCOUNT—			
Balance, 31st December, 1915 . . .		46,069 19 9	
Deduct—			
Capital Expenditure Wisley Gardens	8,045 2 3		
Bad Debts	9 18 3		
		8,055 0 6	
		38,014 19 3	
,, REVENUE FOR THE YEAR, as per annexed Account . . .	£10,035 3 11		
Less WISLEY GARDENS, Excess of Expenditure over Revenue	4,759 19 3		
		5,275 4 8	
			43,290 3 11
			£96,210 7 7

ASSETS.

	£ s. d.	£ s. d.
By CAPITAL EXPENDITURE—		
„ NEW HALL AND OFFICES—		
As at 31st December, 1915 . . .	41,277 13 4	
„ FURNISHING HALL AND OFFICES—		
As at 31st December, 1915 . . .	2,464 9 8	
„ FREEHOLD LAND AND COTTAGES AT WISLEY .	2,260 0 0	
		46,002 3 0
„ APPLIANCES FOR SHOWS		236 11 0
„ SUNDRY DEBTORS AND PAYMENTS MADE IN ADVANCE		1,611 8 11
„ WOKING WATER CO.— Deposit in respect of laying water-mains from Ripley to Wisley Gardens . . .		1,260 0 0
„ INVESTMENT of DEPRECIATION and RENEWAL and RESERVE ACCOUNT—		
3½ % India Stock £2,367 18 9 . . *cost*	2,211 12 10	
2½ % Consols £449 19 9 . . . . „	265 9 4	
		2,477 2 2
„ INVESTMENTS, as per Schedule . . . *at cost* (*In common with most pre-war Securities the above have, for sale purposes, considerably depreciated, but for revenue purposes they bring in the same income as before.*)		42,852 10 6
„ CASH—		
At Bank	215 0 5	
On Deposit	1,500 0 0	
In Hand	55 11 7	
		1,770 12 0
		£96,210 7 7

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st Dec., 1916.

ALFRED C. HARPER, *Auditor*
(HARPER BROTHERS & FEATHER, *Chartered Accountants*),
35 GREAT TOWER STREET, LONDON, E.C.

19th January, 1917.

Dr. WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE

	£ s. d.	£ s. d.	£ s. d.
To Salaries—			
Garden		475 5 0	
Laboratory		1,448 0 10	
			1,923 5 10
„ Rates and Taxes		197 1 9	
„ Water Rate		51 18 9	
„ Insurances		66 14 6	
„ Labour		1,678 15 2	
„ Garden Implements		42 13 2	
„ Loam and Manure		64 9 2	
„ Repairs		213 17 7	
„ Fuel		340 13 6	
„ Miscellaneous Expenses—			
Garden	226 9 3		
Laboratory	237 1 3		
		463 10 6	
„ Gratuities		24 4 0	
„ Cartage		112 13 11	
„ Trees and Shrubs, and Rock Garden		12 8 8	
			3,269 0 8
„ Cost of Growing, Packing and Distribution of Plants to Fellows			269 16 7
„ Staff Pension		236 14 6	
Less contributed by the Staff, as per scheme		90 9 2	
			146 5 4
„ Depreciation— Glass Houses, Plant and Materials			506 18 1
„ Special Expenditure— Tithe Redemption			42 18 4
			£6,158 4 10

	£ s. d.	£	s.	d.
By Dividends and Interest		1,053	0	11
,, Produce Sold		79	9	8
,, Students' Fees		15	15	0
,, Education Grant—Wisley School		250	0	0
,, Balance, being excess of Expenditure over Revenue		4,759	19	3
		£6,158	4	10

LIABILITIES.

	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT—						
As at 31st December, 1915	23,314	19	6			
Amount transferred from R. H. Society, 31st December, 1916	8,045	2	3			
Donations	0	2	6			
				31,360	4	3
„ ENDOWMENT FUND				25,000	0	0
„ DEPRECIATION AND RENEWALS—						
As at 31st December, 1915	3,171	1	3			
Added, 1916	340	3	6			
				3,511	4	9
				£59,871	9	0

SHEET, 31st DECEMBER, 1916. Cr.

ASSETS.

		£ s. d.	£ s. d.
By Dwelling Houses—			
As at 31st December, 1915 .	£5,651 17 4		
Expenditure since . .	155 9 5		
		5,807 6 9	
,, Glass Houses, Ranges, Potting Shed, &c.—			
As at 31st December, 1915		5,202 6 0	
,, Laboratory—			
As at 31st December, 1915 .	£11,344 16 2		
Expenditure since . .	7,447 19 4		
		18,792 15 6	
			29,802 8 3
N.B.—The Wisley Estates are, under the Trust Deed, vested in the Society only so long as it is in the position to use them as an Experimental Garden. The value of the expenditure thereon depends therefore on the continual use of the Garden by the Society.			
,, Inventory of Plant and Loose Effects—			
As taken by Mr. Chittenden			1,202 11 0
,, Motor Car		150 0 0	
Less Depreciation		50 0 0	
			100 0 0
,, Library			255 5 0
			31,360 4 3
,, Investment of Depreciation and Renewals Reserve Account, 31st December, 1915—			
£2,981 11*s.* 10*d.* 3½% India Stock cost	£2,772 7 0		
£675 8*s.* 3*d.* 2½ % Consols cost	398 14 3		
		3,171 1 3	
Add Cash at Bank for Investment, 31st December, 1916		340 3 6	
			3,511 4 9
,, Investments—			
Great Eastern Railway Company 4 % Debenture Stock £3,500		3,535 0 0	
Leopoldina Railway Company, Ltd. 5 % Terminable Debentures £2,000		2,000 0 0	
City of Moscow Loan 1912. 4½ % Bonds £6,000		5,730 0 0	
Buenos Ayres Great Southern Railway Company 5 % Non-Cumulative Preference Stock £2,500		2,825 0 0	
War Stock 4½ % 1925–45, £5,000		5,000 0 0	
Canadian Pacific Railway Company 4 % Perpetual Consolidated Debenture Stock, £4,632.		3,890 17 6	
Consols 2½ % £3,229 5*s.* 6*d.*		1,889 2 6	
London County Consolidated 3½% Stock £135 8*s.* 4*d.*		130 0 0	
			25,000 0 0
			£59,871 9 0

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st Dec., 1916.

ALFRED C. HARPER, *Auditor*
(Harper Brothers & Feather, *Chartered Accountants*),
35 Great Tower Street, London, E.C.

19th January, 1917.

Dr.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes,

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915 . .	1,707 8 9	
,, Dividends received 1916		46 16 10

WILLIAMS

Raised by Donations in 1891 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915 . .	204 2 5	
	204 2 5	
,, Balance 31st December, 1915		23 13 0
,, Dividends received 1916		7 12 10
		31 5 10

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915 . .	542 17 0	
	542 17 0	
,, Balance 31st December, 1915		11 6 0
,, Dividends received 1916		17 18 4
		£29 4 4

NICHOLSON

Raised by Donations in 1908 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915 . .	160 12 11	
,, Dividends received 1916		5 16 9

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915 . .	557 14 6	
,, Balance 31st December, 1915		9 8 4
,, Dividends received, 1916		18 3 4
		27 11 8

TRUST FUND. Cr.

or in any other way the Council may determine.

	£ s. d.	£ s. d.
By Consols, £2,022 8s. 9d. . . . . . cost	1,797 8 9	
„ Revenue and Expenditure Account . . .		46 16 10

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£ s. d.	£ s. d.
By East India Railway Co. Annuity, Class B £7 .	168 0 0	
„ New South Wales Government 4 per cent. Inscribed Stock (1942–62) £36 3s. 1d.	36 2 5	
	204 2 5	
„ Expense of Dies		9 15 0
„ Balance in hands of R. H. Society . . .		21 10 10
		31 5 10

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£ s. d.	£ s. d.
By Midland Railway Consolidated 2½ per cent. Perpetual Preference Stock £400 . . .	290 13 6	
„ Midland Railway Consolidated 2½ per cent. Perpetual Guaranteed Preferential Stock £400	252 3 6	
	542 17 0	
„ Balance in hands of R. H. Society . . .		29 4 4
		£29 4 4

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£ s. d.	£ s. d.
By Tasmanian Government 4 per cent. Inscribed Stock (1940–50), £162 4s. 5d.	160 12 11	
„ Transfer to Wisley Prize Fund . . .		5 16 9

PENSION.

Schrōder to pay to Gardeners' Royal Benevolent Institution for one Pension.

	£ s. d.	£ s. d.
By Great Western Railway 4 per cent. Debenture Stock £500.	557 14 6	
„ Gardeners' Royal Benevolent Institution . .		20 0 0
„ Balance in hands of R. H. Society . . .		7 11 8
		27 11 8

	£ s. d.	£ s. d.
To Amount of Fund 31st December, 1915	6,063 3 6	
,, Contribution from R. H. Society, 31st December, 1916	135 14 1	
	6,198 17 7	
To Balance 31st December, 1915		8 12 6
,, Dividends and Donations received 1916		46 10 6
,, Contribution from R. H. Society, 31st December, 1916		56 5 6
		111 8 6

PRITZEL REVISION

Fund to be raised for the Revision of Pritzel's Iconum

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915	859 2 2	
,, Balance, 31st December, 1915		56 17 6
,, Dividends received, 1916		31 7 7
		88 5 1

TRUST. Cr.

	£ s. d.	£ s. d.
By Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock £1,516 held by the Charity Commissioners	1,458 15 7	
,, Value of Library, 31st December, 1915 . .	4,604 7 11	
,, Purchase of Books, 1916 (*See* Report) . .	135 14 1	
	6,198 17 7	
By Librarian's Salary		100 0 0
,, Printing		1 8 6
,, Balance in hands of R. H. Society . . .		10 0 0
		111 8 6

FUND.

Botanicarum Index. Estimated cost, £3,000.

	£ s. d.	£ s. d.
By India 2½ per cent. Stock, £1,367 13 6 . .	859 2 2	
,, Balance in hands of R. H. Society . . .		88 5 1
		88 5 1

SCHEDULE OF INVESTMENTS.

31st December, 1916.

			£	s.	d.
2½ %	Consols, £5,324 19s. 8d.	cost	5,081	6	0
3 %	Local Loans, £5,800	,,	6,006	16	6
3½ %	Indian Rupee Paper, 37,000 Rupees	,,	2,462	14	4
3½ %	Dominion of Canada Registered Stock (1930–1950), £2,000	,,	2,000	0	0
3½ %	London County Consolidated Stock, £2,864 11s. 8d.	,,	2,884	6	10
3½ %	India Stock £2,063 4s.	,,	2,024	10	4
5 %	Havana Terminal Railroad Company Mortgage Debenture Bonds £8,300	,,	8,946	0	0
4½ %	Central Argentine Railway, Limited, Consolidated Preference Stock £2,800	,,	2,907	3	6
5 %	State of San Paulo Treasury Bonds (1913) £5,000	,,	4,897	13	0
4 %	Central Argentine Railway, Limited, Debenture Stock, £600	,,	537	15	10
2½ %	India Stock, £186 9s.	,,	109	2	2
4 %	Mortgage on Freehold £1,000	,,	1,000	0	0
4½ %	War Stock (1925–1945), £2,000	,,	1,995	2	0
5 %	Exchequer Bonds, £2,000	,,	2,000	0	0
			£42,852	10	6

GENERAL MEETING.

February 27, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair.

Fellows elected (16).—Lady Beaverbrook, R. W. Beeston, J. P. Bland, Albert Braithwaite, Mrs. Jane Dodds, Miss S. Forssman, C. A. Heron, John Hilton, Miss D. Leeper, Miss E. M. Marindin, Mrs. G. Milne, T. N. Roberts, W. W. Roberts, J. E. Sarjeant, G. C. Shambrook, F. Stacey.

Affiliated Society.—The Cefn Forest and District Horticultural Society. *Union of Horticultural Mutual Improvement Society,* Leadgate, Iveston, and District Amateur Gardening Association.

A lecture was given by Mr. John Dickson on "The Herbaceous Border" (see p. 1).

GENERAL MEETING.

March 13, 1917.

Rev. J. Jacob in the Chair.

Fellows elected (18).—W. Baskin, Mrs. R. Bernard, G. F. Britton, Stanley Clifton, F. Clipstone, R. G. Crittall, R. E. Dinn, J. Duffy, W. M. M. Forwood, W. R. K. Gandell, Denis Hannigan, H. Hassall, J. S. Haycraft, M. B. F. Major, R. W. May, Miss E. V. Pale, E. L. Vaughan, M.A., E. B. Wood.

Fellows resident abroad (1).—Arthur J. F. Gibbons (Guernsey).

Associate (1).—G. E. Kitchen.

A lecture on "The Cultivation of Vegetables" was given by Mr. Edwin Beckett, V.M.H. (see p. 5).

GENERAL MEETING.

March 27, 1917.

Mr. E. H. Jenkins, F.R.H.S., in the Chair.

Fellows elected (22).—J. Ansaldo, Alexander Brown, Major Carleton, W. G. Darrington, E. G. Davies, A. B. Dobell, C. Jermyn Ford, Mrs. Halford, W. J. Hande, Miss Hansford, Mrs. E. M. Hart, A. N. Hunter, C. W. Johnson, Mrs. Kershaw, E. J. A. Lant, Mrs. H. P. Martin, S. McLean May, W. Mills, Jonathan Morgan, Mrs. H. Parsons, W. Van Eyk, A. F. O. Wallbrook.

Associates (2).—John Craven, Miss R. Ricardo.

A lecture was given by Mr. J. C. House on "Violets and their Cultivation" (see p. 16).

GENERAL MEETING.

April 11, 1917.

Mr. James Hudson, V.M.H., in the Chair.

Fellows elected (18).—Mrs. Hugh Adams, C. J. Alexander, Herbert Barber, H. E. Boardman, Mrs. P. Bonjuta, Sigurd Borjesen, R. S. Brown, Thomas Cadogan, I. W. Fletcher, W. F. Gullick, Hugh Highgate, H. P. Martin, M. E. Mills, Miss J. S. Oliver, R. C. Reed, J. S. Skinner, the Hon. Katherine Thring, Miss G. S. Wilbee.

Fellows resident abroad (2).—Capt. A. N. John (Punjab), Rev. A. H. Scott (Canada).

Associate (1).—Alice P. Craig.

Affiliated Society (1).—I. M. M. Horticultural Society.

A lecture was given by Mr. E. A. Bunyard, F.L.S., on "Increasing the Home Fruit Supply" (see p. 23).

GENERAL MEETING.

April 24, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair.

Fellows elected (8).—W. H. Beaumont, J. W. Cartner, Mrs. Dick, Major W. F. Dick, Miss L. Earnshaw, G. R. Groom, J. E. Spencer, T. C. Williamson.

Associate (1).—Miss Margaret V. Snow.

Affiliated Society (1).—Tisbury District Horticultural Society.

A lecture was given by Mr. R. Farrer, J.P., on "The Southern Kansu Marches of Tibet," 1916.

GENERAL MEETING.

May 8, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair.

Fellows elected (13).—Miss M. Battiscombe, L. W. Dixon, Major-Gen. G. G. A. Egerton, Viscountess Galway, Mrs. Ruth Gow, R. A. Hatton, G. Hooper, Mrs. Hull, H. Leetham, D. E. Mee, R. Phillips, G. R. J. Rumbol, Mrs. A. W. Tait.

Associates (2).—A. J. Elgar, C. H. Wheeler.

A lecture was given by Mr. R. Farrer, J.P., on "The Northern Kansu Marches of Tibet," 1916.

GENERAL MEETING.

MAY 22, 1917.

Mr. F. J. HANBURY, F.L.S., in the Chair.

Fellows elected (19).—Hon. Mrs. R. Beckett, Mrs. Alfred Bell, J. Brough, 2nd Lieut. J. Codrington,. Mrs. O'Cory, Brigadier-Gen. A. H. Cowie, Lieut.-Col. A. Fletcher, Mrs. M. Harris, C. R. Hill, E. Jacobs, S. J. Johnson, Mrs. A. L. Johnson, C. E. Kennedy, Mrs. E. M. Lambert, V. Murray, H. E. Paling, H. M. Taylor, W. C. Towle, Mrs. A. D. Wheatley.

Resident abroad (1).—I. H. Burkhill (Singapore).

Societies Affiliated (1).—Fort Dunlop Gardens Association.

A lecture on "Snowdrops" was given by Mr. E. A. Bowles, M.A., V.M.H. (see p. 28).

GENERAL MEETING.

JUNE 5, 1917.

Mr. W. A. BILNEY, J.P., in the Chair.

Fellows elected (16).—G. A. Apcar, Mrs. Barclay-Brown, Miss M. Dunlop, Samuel Ewins, William Garwood, L. Kinns, Lady Lyon, T. Pank, D. F. Pullar, John Roscoe, L. Scott, Miss M. Shaw, F. S. Smith, A. C. Thrupp, Miss M. Tuke, Mrs. A. A. Yarrow.

Associate (1).—Miss Garwood.

A lecture by Mr. Amos Perry on "Delphiniums" was read by the Chairman.

GENERAL MEETING.

JUNE 19, 1917.

Sir J. T. DILLWYN LLEWELYN, Bt., V.M.H., in the Chair.

Fellows elected (15).—F. W. Birkinshaw, William Coad, Mrs. Durie, Mrs. E. Haydon, G. S. Heath, J. Heyes, S. Hill-Jones, A. J. Jennings, G. Jenkins, A. H. Kersey, Miss A. Major, A. Robinson, G. Rogers, Mrs. Thursley, E. W. Tickle.

Societies Affiliated (6).—Beaconsfield and District Produce Society, Cwmbach Horticultural Society, Dunstable Allotment Holders' Association, Handsworth Allotment and Garden Holders' Association, Hull Garden Village Horticultural Society, Raynes Park District Horticultural Society.

A lecture on "Border Carnations" was given by Mr. J. Douglas (see p. 43).

SCIENTIFIC COMMITTEE.

JANUARY 16, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and three members present.

The only business before the Committee was a letter from Mr. J. Douglas referring to the article in *The Garden* on *Dianthus* × *Allwoodii.* The Committee desired that it should be pointed out that the Certificate of Appreciation was awarded to Mr. Allwood for his work in raising the forms which he exhibited, not to the plant, and that the name was applied to the whole of the hybrids between the Pink and the Carnation, to which cross no name had hitherto been given.

SCIENTIFIC COMMITTEE, JANUARY 30, 1917.

Mr. E. A. BOWLES, M.A., in the Chair, and four members present.

Galanthus Elwesii var. *Whittallii.*—Mr. Bowles said he had examined a Snowdrop sent by Mr. Chapman and found it to be a form of *G. Elwesii* with very wide inner segments, so wide that they overlapped considerably at the edges, giving an almost semi-double appearance to the flower.

Narcissus cyclamineus hybrid.—Mr. Bowles also showed a Narcissus seedling from *N. cyclamineus*, but with broader leaves, paler corona, and very pale segments. The greenish inflated spathe suggested *N. praecox* as one of the parents.

'Wood Flower.'—Mr. W. C. Worsdell, F.L.S., showed a piece of a branch upon which a species of Phoradendron had been growing. It showed the remarkable grooved expansion produced by the growth of the parasite, which has almost the form of a flower (giving rise to the common name). It came from the Argentine.

SCIENTIFIC COMMITTEE, FEBRUARY 13, 1917.

Sir EVERARD IM THURN in the Chair, and six members present.

Tulipa Kaufmanniana.—Mr. J. H. Chapman exhibited flowering plants of *Tulipa Kaufmanniana,* a species introduced to cultivation about 1877 and awarded F.C.C. 1897. The plants shown were dwarf, bright rose on the back of the exterior segments, yellow at base inside, with a carmine spot about midway down the segments inside, and margined with pale cream or white. They were thus somewhat different from the form certificated and from those figured in

The Garden and the *Botanical Magazine*, and were, further, easy to propagate, which some forms of this species are not. The whole of Mr. Chapman's stock had been derived from one bulb.

Stipules of Hawthorn.—Mr. W. C. Worsdell, F.L.S., showed specimens of leaves from *Crataegus sinaica*, showing intermediate steps from leaf segments to so-called stipules and demonstrating that the latter belonged to the leaf-blade, not to the leaf-base, as true stipules do.

Leaves of Hybrid Orchids.—Mr. J. Ramsbottom, M.A., exhibited a series of slides showing the characters of leaves of hybrid Orchids. The series included sections of the leaves of thirteen primary hybrids and their parents :—

♀	♂	Hybrid.
Cochlioda Noezliana	× *Ada aurantiaca*	(*Adioda*).
C. Noezliana	× *Miltonia vexillaria*	(*Miltonioda* × *Harwoodii*)
C. Noezliana	× *Odontoglossum cordatum*	(*Odiontioda* × *Craveniana*).
C. Noezliana	× *O. Harryanum*	(*Odontioda* × *Charlesworthii*).
C. Noezliana	× *Oncidium incurvum*	(*Oncidioda* × *Charlesworthii*).
C. Noezliana	× *O. macranthum*	(*Oncidioda* × *Cooksoniae*).
Laelia cinnabarina	× *Epidendrum prismatocarpum*	(*Epilaelia*).
L. tenebrosa	× *E. prismatocarpum*	(*Epilaelia*).
Odontoglossum Edwardii	× *Cochlioda vulcanica.*	
O. Edwardii	× *Rossii*	(*O.* × 'Antiope').
O. Uro-Skinneri	× *Miltonia Schroederiana.*	
O. Uro-Skinneri	× *O. Edwardii*	(*O. Grogoniae*).
Vanda teres	× *V. suavis.*	

Also two secondary hybrids :—

Odontioda × *Charlesworthii*	× *Odontoglossum Harryanum*	(*Odontioda Brewii*).
Odontoglossum Uro-Skinneri	× *Odontioda* × *Charlesworthii*	(*Odontioda* 'Irene')

They had been prepared by Mr. Charlesworth, who was studying the structure of hybrid Orchids, and it was found that where a structure existed in both parents, but developed to different degrees in them, the hybrid usually showed the same structure developed in an intermediate fashion ; when a structure was present in only one of the parents it might or might not be present in the hybrid, and if present was usually less well developed than in the parent possessing the character.

A Large Rhododendron.—Sir Everard im Thurn exhibited photographs of a tree of *Rhododendron arboreum*, growing in the rain forest of Ceylon, to call attention to the huge size of its trunks—of which there were several—each almost as large as a man's body, and showing great burrs and twists freely developed along them (fig. 34).

Scientific Committee, February 27, 1917.

Mr. E. A. Bowles in the Chair, and nine members present.

The late Mr. George Massee.—The Chairman referred to the great loss the Committee had sustained in the death of Mr. George Massee, V.M.H., who had for many years been a valued member of the Scientific Committee, and the Committee unanimously desired that its expression of sympathy should be sent to his family.

The Action of Light in Inducing Variation.—Col. H. E. Rawson stated that "by the method of selective screening which he adopts with plants the coloured diffraction bands due to interference at any opaque edge are entirely transformed or their saturation modified. With the aid of a prism this is perceptible on every organ down to the finest filaments, and in the case of even minutely serrated edges of leaves. In considering changes in the intensity of light at different altitudes of the sun such modification should not be overlooked. The importance of this observation will be evident" to those who believe that the changes in the Tropaeolum which Col. Rawson has exhibited from time to time are the result of a response to changes in light intensity.

Scale on Ixora coccinea.—Mr. W. Hales, A.L.S., exhibited scales of a curious filamentous shape occurring on the foliage of *Ixora coccinea* at the Chelsea Physic Garden, and remarked upon the difficulty of removing them by ordinary sponging. The scale appeared to be *Ischnaspis filiformis* (figured in the "Monograph Brit. Coccideae," I., p. 20, pl. xxviii).

Anthoxanthum Puelii.—Mr. Fraser, F.L.S., exhibited dried specimens of *Anthoxanthum Puelii* and of *A. odoratum.* The former he had found growing in the grounds at Holland House. It is an annual of tufted growth, and regarded as a pasture or lawn grass quite useless —contrasting remarkably in its habit and growth with the more valuable *A. odoratum.*

The Food Value of Garden Crops.—Some discussion took place with regard to the relative food values of commonly cultivated vegetables, in the course of which the remarkable pre-eminence of the potato and the comparatively small value of the garden pea as a heat unit producer per unit of area were remarked upon. A list will be found in the R.H.S. Pamphlet on the "Cultivation of an Allotment."

Scientific Committee, March 13, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and five members present.

Seedlings of Acers.—Mr. J. Fraser, F.L.S., showed a series of seedlings of *Acer Pseudoplatanus* and *A. campestre* from wild sources, the former being more common than the latter.

Galls on Cabbage.—Mr. W. C. Worsdell, F.L.S., showed a cabbage having a gall on the stem caused by *Ceutorhynchus sulcicollis.*

Diseased Orchids.—Mr. C. J. Lucas sent several orchids showing curious mottling of leaves, &c., which were referred to Wisley for further examination. (No fungus was found upon these leaves.)

SCIENTIFIC COMMITTEE, MARCH 27, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Two-flowered Snowdrop.—Mr. Bowles showed, on behalf of Mr. Elwes, a two-flowered plant of a seedling of *Galanthus Elwesii.* It had the usual two foliage leaves from the soil, but the flowering stem bore a third leaf, about three inches above the soil level, with a slight swelling at the base, and having in its axil a second flower. The axis of the bulb had apparently elongated and carried the flowering stem up above ground.

Alnus glutinosa.—Mr. J. Fraser, F.L.S., showed a series of seedlings of the common Alder (*Alnus glutinosa*), which he had found growing near the Thames and in other places. He drew attention to the nodules on their roots, which, he pointed out, were inhabited by organisms, which, according to Hiltner, enabled the Alder to obtain nitrogen from the air much in the same way as does *Pseudomonas radicicola* in the case of leguminous plants.

Crocuses.—Mr. Bowles showed a series of Crocus flowers, including various forms of *C. chrysanthus* of different shades of sulphur and yellow, forms apparently of *C. biflorus*, some of which were of blue shades and intergrading into *chrysanthus* ; *C. Balansae* with mahogany-coloured outer segments ; a seedling of *C. minimus*, with much larger flowers than usual, and with more substance ; very small forms apparently of *C. vernus* collected in Montenegro, and perhaps connected with Maw's curious plant from that district ; seedlings of *C. Sieberi versicolor* and crosses between that and the type *C. veluchensis* from Greece ; a curious form between *C. Tommassinianus* and *C. banaticus* ; and others.

Double-spathed Richardia.—Mr. H. W. Ratcliff sent a double-spathed *Richardia africana*, with slight green markings on the second, lower spathe. This development is not very uncommon in this and other species of *Richardia.*

Gall-like Growths in Prunus Pseudocerasus.—Mr. R. I. Lynch, V.M.H., sent shoots of this rare tree from Cambridge Botanic Garden, showing groups of adventitious buds on swollen places on the shoots ; the tree was otherwise healthy, and it was suggested that the probable cause of the growth was damage by sparrows to the bud at the end of a shoot, and the subsequent development of buds present in the axils of the scale leaves.

Scientific Committee, April 11, 1917.

Mr. W. Hales, A.L.S., in the Chair, and three members present.

Fasciated Rose.—Mr. J. Fraser, F.L.S., showed shoots of a Rose very much fasciated towards the top, and, as often happens, cylindrical at the base.

Chlorosis in Fagus sylvatica.—He also exhibited shoots of Beech which he had collected on a chalk hill in which all the leaves were yellow, and remarked upon the frequency of the occurrence of chlorosis in plants growing in chalky soil. The disease appears to be due to insufficiency of iron, and is usually curable by the addition of iron sulphate to the soil.

Apple Bark Splitting.—Mr. F. J. Baker, A.R.C.S., showed specimens of Apple shoots in which, during the past winter, longitudinal splits in the bark had appeared. The splitting has occurred in many places, and is probably due to severe frosts. The branches exhibited had evidently been taken from trees growing in a wet soil.

Scientific Committee, April 24, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Forms of Agrostis alba.—Mr. J. Fraser, F.L.S., showed a series of specimens of forms of *Agrostis alba* from various localities, illustrating the wide range of variation which this species exhibits in its range from seashore to wet pasture lands.

Primula stenocalyx.—Mr. Bowles showed specimens of the two forms of this Chinese species, the one with, the other without, scent. Mr. Farrer has given an account of the two in his report of his Chinese journeys. He also showed flowers of the form called *Primula Loczii*, nearly related to *P. farinosa*, but forming stolons and several plants around the parent one.

American Gooseberry Mildew.—The following note on observations made by Mrs. E. V. Horne at the R.H.S. Laboratory at Wisley on the effect of Burgundy mixture on the winter fruits of the American Gooseberry mildew was read :—

"During the late autumn and winter I collected and examined a large number of twigs from Gooseberry bushes affected with the American Gooseberry mildew at Wisley, which had been sprayed with Burgundy mixture by Dr. Horne in July 1916, with the object of discovering whether the spraying had destroyed the vitality of the perithecia (winter fruits).

"Spraying was done after mature winter fruits had formed on a large number of the twigs. Prior to the spraying, several twigs

FIG. 34.—RHODODENDRON ARBOREUM IN A CEYLON FOREST. [To face p. xxxii.

Fig. 35.—Perennial Aster (n.b.) 'J. S. Baker' (*Bakers*).

were labelled, viz.: (1) Twigs without mildew; (2) twigs with white mildew only, perithecia not formed; (3) twigs with mature perithecia.

"The results were as follows:

"1. Twigs not mildewed at the time of spraying: No mildew subsequently appeared.

"2. Twigs with white mildew, but no perithecia at the time of spraying: No perithecia were subsequently observed, with the exception of a very few young ones in a few cases, probably present at the time of spraying. The contents of these were shrivelled.

"3. Twigs with mature perithecia present at the time of spraying: The perithecia contained shrivelled asci and shrivelled ascospores, or ascospores which, when immersed in water or dilute sugar solution and pressed out of the perithecia, burst within a few seconds. The ascospores were not discharged naturally and failed to germinate.

"The perithecia from unsprayed bushes, used as a control, discharged perfectly healthy asci and ascospores, which did not burst when immersed in sugar solution, but sometimes burst in water after the lapse of a comparatively long period. Ascospores were discharged from these perithecia and collected on cover-glasses arranged at a distance of one quarter of an inch to over two inches from the perithecia. On several occasions the ascospores germinated, producing a short germ tube. Unsprayed twigs from other localities yielded similar results.

"Twigs sent for examination from a locality where the operator admitted that the bushes were sprayed with a mixture incorrectly prepared yielded a large proportion of perithecia capable of ejecting spores.

"The ejection of ascospores has been observed in December, January, March, and April.

"From these results it is evident that spraying with Burgundy mixture was effective, not only in preventing the appearance of mildew, but also in destroying it when present, whether in an early or in an advanced stage in its life-history."

The mixtures used were:

Copper sulphate	$9\frac{3}{4}$ oz.
Sodium carbonate (washing-soda) .	11 oz.
Soap powder	6 oz.
Water	6 gallons

and

Copper sulphate	$9\frac{3}{4}$ oz.
Sodium carbonate (washing-soda) .	11 oz.
Soap powder	12 oz.
Water	12 gallons.

Scientific Committee, May 8, 1917.

Mr. H. J. Elwes, F.R.S., V.M.H., in the Chair, with eight members present and Mr. R. Farrer (visitor).

Prunus spinosa forms.—Mr. J. Fraser, F.L.S., showed dried specimens of a number of forms of *Prunus spinosa*, including the variety *macrocarpa*, which he regarded as a hybrid between *P. spinosa* and *P. communis.*

Narcissi.—Mr. Bowles showed flowers of the uncommon *Narcissus dubius* and the rare white form of *N. muticus*, which seems so difficult to grow and establish in this country.

Various Plants.—Mr. Elwes showed *Iris Wattii* grown in a cold house, where, like *I. fimbriata*, it succeeds much better than outdoors, good growth being apparently necessary before a good flowering spike can be developed; *Fritillaria gracilis*, which Mr. Bowles introduced from Montenegro; *Habranthus pratensis*; *Alpinia Elwesii*, from Formosa; *Arundina bambusaefolia*, from India, an Orchid rarely grown well now; *Rehmannia elatior* and *R. Henryi*, both cold-house plants; and *Cymbidium devoniensis.*

Scientific Committee, May 22, 1917.

Dr. A. B. Rendle, F.R.S., in the Chair, and eight members present.

Gall on Rhododendron ferrugineum.—Mr. W. C. Worsdell, F.L.S., showed specimens of the well-known gall on *Rhododendron ferrugineum*, due to the attack of the fungus *Exobasidium Rhododendri.* This gall usually occurs on the leaves, but in one case on the plants shown it was on the corolla.

Varieties of Pyrus Aria.—Mr. J. Fraser, F.L.S., showed specimens and commented upon the forms of *Pyrus Aria* which he had collected from wild sources in Surrey. Among them was one approaching the variety *salicifolia*, and another of the variety *majestica.* The latter is particularly interesting, for it is the form known as the Nepaul Service tree, or *Pyrus Aria nepalensis* (though it is not known to occur in Nepaul), and is generally assumed to have originated in nursery grounds.

Alteration in foliage of Tropaeolum.—Col. H. E. Rawson exhibited a plant of *Tropaeolum tuberosum* to show what he considered to be the sun's influence in causing the leaves to divide, as they normally do, into any number up to five lobes. He said "The division has been observed taking place at critical altitudes of the sun, which confirmed previous years' observations. Prior to the leaf dividing, precipitation is seen to take place from the margin inwards, which indicated the exact vein affected. This precipitation, which is reversible, I associate with the starch of the tuberous plant considered to be a colloidal phenomenon."

Tetramerous flowers of Narcissus.—From two sources came tetra-

merous flowers of Narcissi; in each case there were eight perianth pieces, eight stamens, and four carpels. The tetramerous condition of these flowers seems, therefore, not uncommon, and it is not rare in nearly allied plants.

Scientific Committee, June 5, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Many-flowered Tulips.—Mr. W. C. Worsdell, F.L.S., remarked upon the branched Tulips shown at the previous meeting, which are common especially among Darwin varieties in many gardens, that the many-flowered condition arose from adnation of branches, not from fasciation, as might appear probable from the external characters of the growths. He drew attention to the occurrence of branching in some species, as in *Tulipa biflora*, *T. saxatilis*, and *T. praestans*, and Mr. Bowles remarked that it seemed to be a primitive condition.

Cup-shaped Leaves.—Mr. J. Fraser, F.L.S., showed a "blind" Cauliflower in which a leaf had assumed the form of a cup. This is not uncommon in Cauliflowers, and is associated with the occurrence of a leaf at the tip of a shoot where it takes the place of a terminal bud. Mr. Anstis sent a similar growth in Aucuba from his garden at Birmingham, where the two opposite leaves formed a cylinder nearly 2 inches long before their free parts were reached.

Pyrus torminalis &c.—Mr. J. Fraser showed a series of specimens which he had collected in various localities, mostly on the Surrey downs, of *Pyrus torminalis*, *P. intermedia*, and *P. latifolia*. He and other members of the Committee remarked upon the possible hybrid origin of *P. latifolia* and *P. intermedia*, and the possibility that birds had carried the seeds of some of the forms from neighbouring gardens to apparently wild localities, where Mr. Fraser had found the trees growing.

Various Plants.—Mr. H. J. Elwes, F.R.S., showed a series of plants from his garden, including *Paeonia Emodi*, *P. albiflora*, *P. Broteri*, from Portugal, a bright, light form of *P. lobata* (a variety of *P. officinalis*), and *Polygonatum verticillatum*, which he had collected many years ago in Perthshire. He also showed a large, dark form of Camassia, probably a seedling from *C. Leichtlinii*.

Scientific Committee, June 19, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with nine members present, and Mr. R. Farrer (visitor).

Pine Rust.—Mr. A. D. Cotton showed specimens of Pine blister rust on *Pinus Strobus* from Haslemere. This disease is due to the fungus *Cronartium Ribicola*, and has its alternate stage on Black Currant or some other species of Ribes, occurring at times on the

Red Currant, and rarely, in this country, on the Gooseberry. It has occurred on the Gooseberry at Oxford.

Potato Spraying.—Some discussion took place with regard to the relative values of Bordeaux and Burgundy mixtures for spraying Potatos. In the former quick-lime is required, in the latter washing-soda; usually washing-soda is of more constant composition than quick-lime, and the spray is therefore easier to make. In both cases the more dilute the two materials to be mixed before the mixture is made the better, and in both cases also the mixing should be done immediately before the spray is used. The experimental spraying in Ireland during the past few years, as well as other experiments, shows that the 1 per cent. Burgundy mixture is an excellent and safe preventive of the disease caused by *Phytophthora infestans.* The proportions of the materials used are 4 lb. copper sulphate, 5 lb. washing-soda, and 40 gallons of water.

Various Plants.—Mr. Bowles showed, on behalf of Mr. Elwes, *Orchis foliosa,* a fine-flowered form of *O. latifolia, O. incarnata, Arisaema concinna* (from Himalaya and the Tibet border), a smaller ♀ plant of a species of *Arisaema, Polygonatum* with a foliaceous inflorescence which is constantly produced, and *Roscoea* (*Cautleya*) *lutea,* a hardy plant from the Himalaya belonging to the Scitamineae. He also showed from Miss Willmott's garden at Warley the uncommon *Iris Sintenisii* from Asia Minor; from his own at Waltham Cross *Meconopsis latifolia,* the semi-double form; blue and white forms of *Campanula patula,* and a form with six petals; a pale-blue form of Ranunculus, and the uncommon *Centranthus angustifolius,* which he had collected at Lautaret.

Hybrid Mints.—Mr. J. Fraser, F.L.S., showed a hybrid of *Mentha rotundifolia* × *viridis* which had been collected near Swanage; it was nearer to *rotundifolia* than to its other parent.

Hail: Effect on Onions.—Mr. Fraser also drew attention to the effect of hail upon Onions, the leaves of which show white bruises caused by recent hailstorms.

Xyleborus dispar in Sycamore.—Mr. Cheal sent specimens of the common Sycamore, *Acer Pseudoplatanus,* from the Crawley district, bored by the shot-hole borer, *Xyleborus dispar,* and containing the larvæ of the beetle in great numbers. This pest also attacks fruit-trees, including Plums, Pears, and Apples, and is a difficult one to deal with, the complete destruction of infested trees being probably the best course to pursue.

Effect of Salt Water.—Dr. Voelcker sent a note upon a case of scorching of Peaches and Vines, where, the supply from a well having given out, water from a lake had been used; the analysis of the lake water showed no less than 162½ grains of salts to the gallon, magnesia being present also, and suggested the infiltration of sea water. The well water contained only 8 grains of salts to the gallon.

Populus lasiocarpa.—Mr. J. C. Allgrove showed a fruiting specimen of this fine tree from Langley.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 16, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Cheal, Crawley, for Apples.

Cultural Commendation.

To Mr. E. Beckett, V.M.H., Elstree, for Tomatos 'Early Sunrise' and 'Golden Sunrise.'

The awards recommended by the Sub-Committee at Wisley to Celery and Celeriac on December 14, 1916, were confirmed.

CELERIAC.

Highly Commended.

12, 'Delicatesse' (Barr); 15, 'Late Summer' (Barr); 3, 'Ordinary Type' (Sydenham); 1, 'Selected' (Sutton).

CELERY.

Award of Merit.

30, 31, 'Clayworth Prize Pink' (Sydenham, Hurst); 11, 'Invincible White' (Dobbie).

Highly Commended.

6, 'Early Rose' (Hurst); 49, 'Incomparable Crimson' (Carter); 26, 'Matchless Pink' (A. Dickson).

For descriptions of the above see Reports of Wisley Trials (pp. 107, 109).

Other Exhibits.

Mr. E. Beckett, V.M.H., Elstree: Onion 'Autumn Triumph.'
Messrs. Bunyard, Maidstone: Apple 'Orleans Reinette.'
Mr. W. H. Divers, V.M.H., Grantham: Apples.
Messrs. Sutton, Reading: vegetables.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 30, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and six members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Seabrook, Chelmsford: Apple 'Monarch.'

Fruit and Vegetable Committee, February 13, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and fifteen members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Cheal, Crawley, for Apples.

It was proposed, seconded, and carried unanimously that a letter of condolence be sent on behalf of the Fruit and Vegetable Committee to the family of the late Mr. Charles Ross, V.M.H.

Fruit and Vegetable Committee, February 27, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

The following awards were recommended to Savoy Cabbages after trial at Wisley :

Award of Merit.

18, Green Curled (Messrs. Dobbie) ; 44, Late Drumhead (Messrs. Nutting) ; 25, New Year (Messrs. Sutton) ; 41, Ormskirk Late Green (Messrs. Sydenham) ; 43, Ormskirk Hawlmark Selection (Messrs. A. Dickson) ; 42, Ormskirk (Messrs. Nutting).

For descriptions see Reports of Trials at Wisley (vol. xlii. p. 407).

Other Exhibits.

Messrs. Bunyard, Maidstone : Apple ' Sir John Thornycroft.'

Messrs. Cheal, Crawley : Apples.

Fruit and Vegetable Committee, March 13, 1917.

Rev. W. Wilks, M.A., V.M.H., in the Chair, and twelve members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Seabrook, Chelmsford, for Apples.

Other Exhibits.

Mr. E. Beckett, V.M.H., Elstree : Onion ' Autumn Triumph.'

Mr. C. Dixon, Kensington : Pear ' Beurré Rance.'

Fruit and Vegetable Committee, March 27, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and fourteen members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. G. Bunyard, Maidstone : Apple ' Encore.'

Messrs. Veitch, Exeter : Apples.

Fruit and Vegetable Committee, April 11, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and two members present.

No exhibits were before the Committee on this occasion. A short discussion took place on the cracking of the bark of fruit trees caused by the weather.

Fruit and Vegetable Committee, April 24, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and thirteen members present.

Award Recommended :—

Silver-gilt Banksian Medal.

To the Alliance Vegetable Company, London, for dried vegetables.

Other Exhibit.

Mr. G. W. Miller, Wisbech : Rhubarb 'The Sutton.'

Fruit and Vegetable Committee, May 8, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for a collection of vegetables.

Silver Banksian Medal.

To Messrs. Dobbie, Edinburgh, for a collection of Potatos.

Other Exhibits.

Mr. J. C. Allgrove, Slough : Apples.
Alliance Vegetable Co., London : dried vegetables.
Mr. F. Davis, Pershore : Apple 'Pershore Pippin.'
Mr. G. W. Miller, Wisbech : Rhubarb 'The Sutton.'
R.H.S. Gardens, Wisley : Potatos.
Mr. R. Staward, Hertford : Cabbage 'Red Braes Early.'
Mr. C. Turner, Slough : Apple 'Newton Wonder.'

Fruit and Vegetable Committee, May 22, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for Potatos.

Silver Banksian Medal.

To Hon. Mrs. R. Greville (gr. Mr. H. Prince), Dorking, for vegetables and salads.

It was proposed that a trial should be held at Wisley in 1918 of Potatos raised from seed, not tubers.

Fruit and Vegetable Committee, June 5, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and eleven members present.

Award Recommended :—

Gold Medal.

To Messrs. Barr, Covent Garden, for a collection of vegetables.

Fruit and Vegetable Committee, June 19, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and sixteen members present.

Award Recommended :—

Silver-gilt Banksian Medal.

Mr. V. Banks, London, for bottled fruits and vegetables.

Other Exhibits.

F. H. Chapman, Esq., Rye : Marrow 'Rotherside Orange.'
Mr. E. A. Hall, Bristol : Melon 'Brislington Acquisition.'
Mr. J. Roberts, Tunbridge Wells : Apple 'Gooseberry Pippin.'
Mr. R. Staward, Hertford : Cabbages and Lettuce.
Mr. G. G. Whitelegg, Chislehurst : 'The Newberry.'

FLORAL COMMITTEE.

JANUARY 16, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To *Corylus Avellana contorta* (votes 10 for, 5 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A very curious and interesting sport from the common nut, having all its shoots irregularly twisted or contorted. It was first found growing in a hedgerow, and it does not vary, but always keeps true to its peculiar habit of growth.

To *Cyclamen persicum* 'Crimson St. George' (votes 13 for), from St. George's Nursery Co., Harlington. A variety with large, well-formed flowers of a rich crimson colour and handsome variegated foliage. The leaves have a border about 1 inch wide of silver grey, and the centre is green, beautifully veined.

Other Exhibits.

Messrs. Bunyard, Maidstone: *Erlangea tomentosa.*

Messrs. Cannell, Eynsford: Pelargoniums.

Mrs. Hopkinson, Shepperton: hardy plants.

FLORAL COMMITTEE, JANUARY 30, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Award Recommended:—

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Other Exhibits.

Messrs. Felton, London: Eucalyptus and Mimosa.

Sir William Lawrence, Bt., Dorking: sport from *Primula malacoides.*

Floral Committee, February 13, 1917.

Mr. E. A. Bowles, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. J. MacDonald, Harpenden, for grasses.

Silver Flora Medal.

To Mr. J. Simmons, Hounslow, for forced bulbs.

Silver Banksian Medal.

To Messrs. Chapman, Rye, for flowering bulbs.
To Messrs. S. Low, Bush Hill Park, for Carnations.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Award of Merit.

To *Freesia* 'La France' (votes 17 for), from Messrs. H. Chapman, Rye. A beautiful seedling, resulting from a cross between *F. Leichtlinii* and a Dutch-raised hybrid. The flowers are very large, of a mauve-violet colour with a white throat, and are sweetly scented.

To *Primula malacoides alba plena* (votes unanimous), from Messrs. W. & J. Brown, Stamford. A good double white form of this well-known greenhouse Primula.

Other Exhibits.

Messrs. Cheal, Crawley : Polyanthus.
Messrs. Dobbie, Edinburgh : Sweet Peas.

Floral Committee, February 27, 1917.

Mr. H. B. May, V.M.H., in the Chair, and eighteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

To Miss J. Gundry, Sidcup Hill, for paintings.
To Messrs. Low, Bush Hill Park, for Cyclamen and Carnations.

Bronze Flora Medal.

To Messrs. Cheal, Crawley, for flowering shrubs and alpines.
To Mr. J. C. Jenner, Rayleigh, for Carnations.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Misses Allen-Brown, Henfield, for Violets.

To Messrs. H. Chapman, Rye, for bulbous plants.

Award of Merit.

To Cyclamen 'Cherry Ripe' (votes 15 for, 2 against), from Messrs. Low, Bush Hill Park. The flowers of this variety are borne very freely, of a striking bright reddish carmine colour, and of medium size. The foliage is dark green and slightly marbled.

Other Exhibit.

Mr. C. Elliott, Stevenage: Saxifrages.

Floral Committee, March 13, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for forced shrubs.

To Messrs. Cuthbert, Southgate, for *Lachenalia Nelsonii.*

Silver Banksian Medal.

To Mr. J. C. Jenner, Rayleigh, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Barr, Taplow, for bulbous plants and Japanese trees.

To Messrs. Carter, Raynes Park, for *Primula malacoides* 'King Albert.'

To Messrs. Cheal, Crawley, for hardy plants.

To Mr. G. Reuthe, Keston, for hardy plants.

Other Exhibits.

Messrs. H. Chapman, Rye: bulbous plants.

L. A. de Sausmarez, Esq., East Molesey: seedling Camellias.

Mr. E. J. Hicks, Twyford: Roses.

Misses Hopkins, Shepperton: hardy plants.

Mr. G. W. Miller, Wisbech: hardy plants.

Floral Committee, March 27, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Mr. J. C. Jenner, Rayleigh, for Carnations.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.
To R.H.S. Gardens, Wisley, for alpines in pans.

Bronze Flora Medal.

To Messrs. Tucker, Oxford, for alpines.

Bronze Banksian Medal.

To Messrs. Barr, Taplow, for alpines.
To Messrs. Cheal, Crawley, for hardy plants.
To Messrs. Cutbush, Highgate, for hardy plants and forced shrubs.
To Mr. E. J. Hicks, Twyford, for Roses.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Mr. G. Reuthe, Keston, for hardy plants.

Cultural Commendation.

To R.H.S. Gardens, Wisley, for a collection of alpines in pots and pans.

First-class Certificate.

To *Saxifraga Burseriana Gloria* (votes 8 for, 3 against), from the R.H.S. Gardens, Wisley. This very fine form of *S. Burseriana*, with pure white flowers over 1 inch across, received an Award of Merit on March 19, 1907. On the present occasion the pan exhibited was a mass of fine flowers.

Other Exhibits.

Messrs. Cannell, Eynsford: Pelargoniums.
Mr. C. Elliott, Stevenage: alpines.
Misses Hopkins, Shepperton: hardy plants.

FLORAL COMMITTEE, APRIL 11, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Flora Medal.

To Mr. E. J. Hicks, Twyford, for Roses.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Bronze Flora Medal.

To Mr. C. Elliott, Stevenage, for miniature rock gardens.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Tucker, Oxford, for alpines.

Other Exhibits.

Messrs. Barr, Taplow: alpines.
Misses Hopkins, Shepperton: hardy plants.

Floral Committee, April 24, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for forced flowering plants.
To Mr. E. J. Hicks, Twyford, for Roses.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. S. Low, Bush Hill Park, for Carnations and Acacias.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Bronze Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Pelargoniums.
To Misses Hopkins, Shepperton, for hardy plants.
To Messrs. Waterer, Sons, & Crisp, Bagshot, for alpines.

Award of Merit.

To *Androsace ciliata* (votes 21 for), from Messrs. Tucker, Oxford. A charming dwarf alpine plant from the Pyrenees, with small deep carmine pink flowers, which are borne abundantly. The height of the plant is from 2 to 3 inches, and the leaves, which are lanceolate oblong with ciliated margins, are in rosettes, forming dense cushions.

Other Exhibits.

A. K. Bulley, Esq., Neston : *Isopyrum grandiflorum.*
Messrs. Cheal, Crawley : hardy plants.
Mr. C. Elliott, Stevenage : alpine plants.
Messrs. Fletcher, Chertsey : seedling Aucuba.
Messrs. Ware, Feltham : *Schizocodon macrophylla.*

Floral Committee, May 4, 1917.

Sub-Committee at Wisley.

Mr. H. B. May, V.M.H., in the Chair, and five members present.

The Sub-Committee inspected the Trial of Stocks under glass and made recommendations for awards to be approved by the full Committee (see p. xlviii).

Floral Committee, May 8, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. E. J. Hicks, Twyford, for Roses.
To R. L. Mond, Esq. (gr. Mr. Hall), Sevenoaks, for Calceolarias.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. S. Low, Bush Hill Park, for Carnations and Acacias.

Silver Banksian Medal.

To Mr. J. C. Allgrove, Slough, for Auriculas.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cutbush, Highgate, for Azaleas, Primulas &c.
To Messrs. Dobbie, Edinburgh, for Schizanthus.
To Mr. J. Douglas, Great Bookham, for Auriculas.
To Mr. J. C. Jenner, Rayleigh, for Carnations.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Messrs. Piper, Langley, for *Rosa Hugonis* and Clematis.

Bronze Flora Medal.

To Messrs. Cannell, Eynsford, for Pelargoniums.
To Messrs. F. Cant, Colchester, for Roses.
To Mr. G. Kerswill, Exeter, for Gentians.
To Mr. G. Prince, Longworth, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. C. Turner, Slough, for Auriculas.

Award of Merit.

To Primula 'Eureka' (votes unanimous), from Adeline, Duchess of Bedford (gr. Mr. J. Dickson), Chenies. A Primula of remarkable vigour, said to be a hybrid between *P. obconica* and *P. sinensis*, the latter being the pollen parent. The flowers are exceptionally large, and are of a rosy carmine colour with a conspicuous greenish eye. They are borne in large trusses, and the foliage is very large and elongated.

To Primula sinopurpurea (votes 9 for, 1 against), from Messrs. Wallace, Colchester. A charming species, introduced from China by Mr. G. Forrest. The flowers are of a deep violet-purple colour with a greenish-white eye, and are borne in heads of 6 or 7 on mealy stalks about 6 inches high. The smooth spathulate leaves are dark green above, and covered with golden meal underneath. They are from 4 to 5 inches long.

To *Rosa Hugonis* (votes 11 for), from Messrs. Piper, Langley. A very distinct species from Western China. The flowers are single, sulphur-yellow in colour, and very freely produced. The plant seems well adapted for growing as a pillar plant or as a weeping standard.

To Schizanthus 'Dr. Badger's Hybrids' (votes unanimous), from Messrs. Dobbie, Edinburgh. A good strain, giving plants of nice compact habit bearing large flowers of a great variety of colours.

Other Exhibits.

Messrs. Cheal, Crawley: hardy plants.
Mr. C. Elliott, Stevenage: Primulas.
H. J. Elwes, Esq., Cheltenham: miscellaneous plants.
Misses Hopkins, Shepperton: hardy plants.
Miss Mangles, Seale: Rhododendron 'Lisa Stillman.'
Mrs. Martineau, Twyford: Ranunculus 'Creamcup.'
Mr. W. H. Robbins, Lewes: Pelargoniums.
Mr. R. Staward, Hertford: Auriculas and Primulas.
Messrs. Tucker, Oxford: alpine plants.
Messrs. Veitch, Exeter: Myosotis 'Blue Eyes.'
Earl of Warwick, Dunmow: Petunia 'Countess of Warwick.'
Mr. C. F. Waters, Balcombe: Carnation 'Emily Gibbs.'

Floral Committee, May 17, 1917.

Sub-Committee at Wisley.

Mr. H. B. May, V.M.H., in the Chair, and four members present.

The Sub-Committee inspected the Trials of Stocks and Myosotis, and made recommendations for awards to be approved by the full Committee (see pp. xlviii, xlix).

Floral Committee, May 22, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Piper, Langley, for miscellaneous climbers and alpines.

Silver Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for flowering trees and shrubs.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Low, Bush Hill Park, for Carnations, Acacias, &c.
To Mr. G. W. Miller, Wisbech, for hardy plants.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for Streptocarpus.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

To Mr. C. Turner, Slough, for Lilacs &c.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cutbush, Highgate, for greenhouse plants and alpines.

Bronze Banksian Medal.

To Messrs. Baker, Codsall, for alpines.

To Mr. R. Bolton, Halstead, for Sweet Peas.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Messrs. Tucker, Oxford, for alpines.

To Yokohama Nursery Co., London, for Wistarias, Maples, dwarf trees, &c.

Award of Merit.

To *Exochorda Alberti macrantha* (votes unanimous), from Messrs. G. Paul, Cheshunt. A hybrid raised by Messrs. Lemoine of Nancy. The habit resembles that of *E. grandiflora*, and it is remarkably free-flowering. The flowers are white, about 1¼ inch across, and are borne in racemes of six to ten.

Other Exhibits.

Adeline, Duchess of Bedford, Chenies: Primula 'Eureka.'

Messrs. Barr, Taplow: *Heuchera tiarelloides.*

Mr. C. Elliott, Stevenage: alpines.

H. J. Elwes, Esq., Cheltenham: Pæonies.

Misses Hopkins, Shepperton: hardy plants.

Mr. G. Kerswill, Exeter: Gentians.

R.H.S. Gardens, Wisley: Primula (Farrer, No. 21) and *Meconopsis quintuplinervia.*

Messrs. Whitelegg, Chislehurst: Schizanthus 'Chislehurst Hybrids.'

Miss E. Willmott, V.M.H., Great Warley: *Lilium Thomsonianum.*

The following recommendations for awards to Stocks grown under glass and Myosotis on trial at Wisley were confirmed. For descriptions see reports of the trials.

STOCKS.

Award of Merit.

14, Crimson Brompton, sent by Messrs. R. Veitch, Exeter; 166, Mammoth Pale Lilac, sent by Mr. Dawkins, Chelsea; 112, Mammoth Pyramid Flesh Colour, sent by Messrs. Hurst, London; 133, Mammoth Rose, sent by Mr. Dawkins, Chelsea; 162, Nice Giant Light Blue, sent by Messrs. Nutting, London.

Highly Commended.

137, Abundance, sent by Messrs. Dickson & Robinson, Manchester; 101, 102, Almond Blossom, sent by Messrs. R. Veitch, Exeter, and Messrs. Hurst, London; 114, 117, 118, Beauty of Nice, sent by Messrs. Dickson & Robinson, Messrs. Hurst, and Messrs. Watkins & Simpson, London; 177, 178, Côte d'Azur, sent by Messrs. R. Veitch and Messrs. Hurst; 45, East Lothian Crimson, sent by Mr. A. Dawkins; 40, East Lothian Scarlet, sent by Messrs. R. Veitch; 13, Giant Brompton Crimson, sent by Messrs. Barr, London; 78, H. J. Vansittart Neale, sent by Messrs. Hurst; 70, Intermediate White, sent by Messrs. R. Veitch; 152, John Bright, sent by Messrs. Dickson & Robinson; 82, 84, 86, Madame Rivoire, sent by Messrs. Dickson & Robinson, R. Veitch, and Hurst; 173, 174, Mammoth Dark Blue, sent by Mr. Dawkins and Messrs. Hurst; 132, Mammoth Pyramidal Rose, sent by Messrs. Hurst; 124, Mammoth Pyramid Salmon Rose, sent by Messrs. Hurst; 156, Mammoth Pyramid 10-week Blood Red, sent by Messrs. Hurst; 147, Mammoth Pyramid 10-week Crimson, sent by Messrs. Hurst; 167, Mammoth Pyramid 10-week Lilac, sent by Messrs. Hurst; 108, Mammoth Pyramid Yellow, sent by Messrs. Hurst; 88, Mont Blanc, sent by Messrs. Hurst; 107, Nice Canary Yellow, sent by Messrs. Watkins & Simpson; 123, Nice Giant Early Salmon, sent by Messrs. Nutting, London; 122, Novelty (unnamed), sent by Messrs. Hurst; 164, 165, Parma Violet, sent by Messrs. Barr, and Messrs. Hurst; 76, Perpetual White, sent by Mr. A. Dawkins; 104, Princess May, sent by Messrs. R. Veitch; 27, Purple Brompton, sent by Messrs. R. Veitch; 119, Pyramid Chamois, sent by Messrs. Watkins & Simpson; 127, 128, 129, Queen Alexandra, sent by Messrs. Hurst, Messrs. Watkins & Simpson, Messrs. Dickson & Robinson; 139, 140, Rose of Nice, sent by Messrs. R. Veitch and Messrs. Hurst; 113, Souvenir de Nice, sent by Messrs. Barr; 28, Violet Queen, sent by Messrs. Daniels, Norwich; 91, White of Nice, sent by Messrs. Watkins & Simpson; 93, White of Nice, No. 2, sent by Messrs. Hurst; 109, Yellow of Nice, sent by Messrs. Hurst.

Myosotis.

Award of Merit.

82, *alpestris* Indigo Queen, sent by Messrs. R. Veitch, Exeter.

Highly Commended.

83, *alpestris* Indigo Queen, sent by Rev. J. Jacob, Whitchurch; 14, *alpestris alba*, sent by Messrs. Hurst, London; 12, *alpestris stricta alba*, sent by Messrs. Hurst; 63, Blue Eyes, sent by Messrs. R. Veitch, Exeter; 62, Bouquet (blue), sent by Messrs. Sutton, Reading; 15, Perfection Rose, sent by Messrs. Sutton; 23, Pink Gem, sent by Messrs. Sutton; 9, Pyramid White, sent by Messrs. Carter, Raynes Park; 87, Royal Blue, sent by Messrs. Sutton; 11, *stricta* White Gem, sent by Messrs. Barr, London; 16, Victoria Rose, sent by Messrs. Barr; 3, White Pearl, sent by Mr. E. H. Bowers, Roscommon.

Floral Committee, June 5, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended:—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas, Antirrhinums, and Aquilegias.

Silver-gilt Banksian Medal.

To Messrs. W. Paul, Waltham Cross, for Roses.
To Messrs. Piper, Langley, for Clematis and alpines.
To Messrs. Wallace, Colchester, for Irises.

Silver Flora Medal.

To Mr. J. C. Allgrove, Slough, for Eremurus and Anchusas.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. S. Low, Bush Hill Park, for Carnations, Streptocarpus, &c.
To Messrs. May, Upper Edmonton, for miscellaneous plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for flowering trees and shrubs.
To Mr. J. Douglas, Great Bookham, for Border Carnations.
To Messrs. G. Paul, Cheshunt, for trees and shrubs.
To Messrs. Whitelegg, Chislehurst, for alpines.

Bronze Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Cutbush, Highgate, for greenhouse and hardy plants.
To Mr. R. C. Notcutt, Woodbridge, for flowering shrubs.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Pelargoniums.
To Mr. F. Gifford, Hornchurch, for Pæonies.
Mr. J. C. Jenner, Rayleigh, for Carnations.

First-class Certificate.

To *Robinia Kelseyi* (votes 16 for, 6 against), from Mr. J. C. Allgrove, Slough. This beautiful deciduous shrub or small tree received an Award of Merit in 1910. The leaves are pinnate, and from 4 to 6 inches long. The rose-pink flowers are borne abundantly in small clusters.

Award of Merit.

To Antirrhinum 'Prima Donna' (votes unanimous), from Messrs. Dobbie, Edinburgh. This is a variety of medium height, and had bold massive spikes of Apricot flowers shaded with salmon, and having a yellow-tinged lip.

To Carnation 'Maldwin Drummond' (votes 12 for, 6 against), from Captain Drummond (gr. Mr. L. Smith), Cadland Park, Southampton. A good perpetual-flowering variety, with large pale salmon-pink flowers. The calyces are non-bursting, and the stems are stiff and wiry.

To *Deutzia Vilmorinae* (votes unanimous), from Mr. J. C. Allgrove, Slough, and Mr. C. Turner, Slough. This is one of the most valuable of the Deutzias, and is a native of Szechwan, China. It is very free-flowering in habit, and the individual flowers are white and measure about 1 inch across. The foliage is oblong lanceolate, dark green above, and glaucous beneath.

To Iris 'Ringdove' (votes 10 for, 1 against), from Messrs. Wallace, Colchester. A beautiful Iris of the Pallida type. The flowers are about 4½ inches deep, the standards are pale violet, and the falls a little deeper. The beard is white, tipped with yellow. The foliage is very glaucous.

To *Iris sibirica* 'Perry's Blue' (votes 15 for, 5 against), from Mr. A. Perry, Enfield. This is the tallest and most effective of the *sibirica* group. The standards are pale mauve, and the falls are violet-mauve in colour, and broad and round in shape.

To *Magnolia Watsonii* (votes 18 for, 1 against), from Mr. J. C. Allgrove, Slough. The flowers of this beautiful species are about 5 or 6 inches across, and strongly perfumed. The inner petals are white, and the outer ones are tinged with rose. The stamens are crimson and form a conspicuous mass in the centre of the flower. The dark-green leaves are obovate and about 5 or 6 inches long.

To *Syringa* 'Miss Ellen Willmott' (votes unanimous), from Mr. C. Turner, Slough, and Messrs. G. Paul, Cheshunt. This is one of the best double white Lilacs in cultivation. The individual flowers are of large size and are borne in large trusses.

Other Exhibits.

Messrs. Chapman, Rye: Irises.
Mr. G. R. Downer, Chichester: Lupines.
Mr. C. Elliott, Stevenage: alpines.
Miss Greaves, Reigate: *Lonicera quinquelocularis.*
Misses Hopkins, Shepperton: hardy plants.
E. McIlwaine, Esq., Belfast: Pyrus 'Anemonefield Scarlet.'
Messrs. Smith, Stranraer: Rhododendron 'Helen Smith.'
Miss Willmott, V.M.H., Great Warley: *Campanula rupestris.*

FLORAL COMMITTEE, JUNE 8, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and five members present.

The Sub-Committee inspected the trials of Perennial Poppies and Tall Bearded Irises, and made recommendations for awards for the consideration of the full Committee (see p. liii).

FLORAL COMMITTEE, JUNE 19, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Kelway, Langport, for Delphiniums and Pæonies.

Silver Flora Medal.

To Mr. J. C. Allgrove, Slough, for hardy plants.
To Messrs. B. R. Cant, Colchester, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. W. Paul, Waltham Cross, for Roses and Pæonies.
To Messrs. Piper, Langley, for Clematis and alpines.
To Mr. L. R. Russell, Richmond, for Acers.
To Messrs. Simpson, Birmingham, for Antirrhinums.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Chaplin, Waltham Cross, for Roses.
To Mr. J. Douglas, Great Bookham, for Border Carnations.
To Messrs. May, Upper Edmonton, for miscellaneous plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Mr. G. Reuthe, Keston, for alpines, Pæonies, &c.
To Mr. C. Turner, Slough, for flowering shrubs.

Bronze Flora Medal.

To Messrs. S. Low, Bush Hill Park, for Roses and Carnations.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Roses and herbaceous plants.
To Messrs. F. Cant, Colchester, for Roses.
To Mr. G. Prince, Longworth, for Roses.
To Messrs. Tucker, Oxford, for alpines.

Award of Merit.

To Sweet Pea 'Alex. Malcolm' (votes 15 for), from Messrs. Dobbie, Edinburgh. A beautifully waved, large-flowered variety of a scarlet colour tinged with cerise.

To Sweet Pea 'Elegance' (votes 9 for, 3 against), from Messrs. Alex. Dickson, Belfast. A beautiful soft blush-pink variety of large size.

To Sweet Pea 'Mrs. Tom Jones' (votes unanimous), from Messrs. Dobbie, Edinburgh. A large lavender-coloured variety shaded with mauve.

To *Trollius Ledebouri* (votes unanimous), from Mr. J. C. Allgrove, Slough. A beautiful hardy plant introduced from Western China by Mr. Purdom in 1909. It grows about 3 feet high, and the semi-double flowers which measure slightly over 2½ inches across are deep orange. The plant is very free-flowering.

Other Exhibits.

Messrs. Cheal, Crawley: Pæonies and Dahlias.
Misses Hopkins, Shepperton: hardy plants.
Mr. H. Howard, Purfleet: seedling Liliums.
C. J. Lucas, Esq., Horsham: *Juniperus procera.*
Messrs. G. Paul, Cheshunt: Roses.
Messrs. R. Veitch, Exeter: *Aster yunnanensis atroviridis.*

The following awards, recommended by the Sub-Committee to Oriental Poppies and Tall Bearded Irises on trial at Wisley, were confirmed.

ORIENTAL POPPIES.

Highly Commended.

66, 'Beauty of Livermere,' sent by Messrs. Wallace; 17, 'Bobs,' sent and raised by Mr. Notcutt, Woodbridge; 67, 'Boadicea,' sent and raised by Messrs. Barr, Taplow; 35, 'Cerise Beauty,' sent and raised by Messrs. Barr; 3, 'Elsie G. Harkness,' sent and raised by Messrs. Harkness; 20, 'Felix,' sent and raised by Mr. Notcutt; 59, 'Hesperia,' sent by Messrs. Bunyard; 32, 'Mrs. J. Harkness,' sent by Messrs. Harkness; 26, 'Mrs. Perry,' sent by Messrs. Barr, raised by Mr. Perry; 48, 'Orange Globe,' sent and raised by Messrs. R. Veitch; 30, 'Rose Queen,' sent by Messrs. Wallace; 52, 'Royal Scarlet,' sent and raised by Messrs. Barr; 56, 'Taplow Scarlet,' sent and raised by Messrs. Barr; 33, 'V. L. Harkness,' sent and raised by Messrs. Harkness.

Commended.

44, 'Silverblick,' sent by Mr. Notcutt.

TALL BEARDED IRISES.

Award of Merit.

841, 'Dominion,' sent and raised by Mr. A. J. Bliss, of Tavistock; 58, 138, 139, 144, 635, '*pallida dalmatica*,' from Messrs. Forbes, R. Veitch, and Wisley; 276, 778, *pallida* 'Princess Beatrice,' from Messrs. Barr and Bunyard; 686, *pallida* 'Rev. W. Wilks,' sent by Messrs. Bunyard; 686 is identical with 276 and 778, and with *pallida dalmatica.*

Highly Commended.

582, 'Le Rêve,' sent by Mr. Perry, Enfield; 'Mary,' from Mr. G. Reuthe, Keston.

Commended.

423, 536, 'Calypso,' sent by Messrs. Barr and Mr. Perry; 810, 'Dawn,' sent by Messrs. Wallace, Colchester; 527, 628, 'Innocenza,' sent by Mr. Perry and Messrs. Forbes; 837, 'Rosalind,' sent by Mr. Bliss, of Tavistock.

For descriptions of the above see reports of Wisley Trials.

ORCHID COMMITTEE.

JANUARY 16, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for a group.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums, Odontiodas, &c.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for hybrid Cymbidiums.

To Messrs. Hassall, Southgate, for Cymbidiums.

First-class Certificate.

To *Odontoglossum* × 'Felicia' (*Thompsonianum* × *crispum*) (votes unanimous), from Messrs. Charlesworth. Flowers nearly as large as those of *O. crispum*, pale rose, heavily blotched with claret colour.

Award of Merit.

To *Cypripedium* × *Lathamianum* var. 'Cardinal Mercier' (*Spicerianum magnificum* × *villosum*) (votes 9 for, 2 against), from the Rev. J. Crombleholme, St. Mary's, Clayton-le-Moors. A fine flower, with white dorsal sepal, heavily flaked with rose-purple. Petals and lip yellow, tinged with mahogany red.

To *Odontoglossum* × 'Conqueror' (*illustrissimum* × *crispum*) (votes unanimous), from Messrs. Armstrong & Brown. Flowers large, white, evenly blotched with rose-purple.

Preliminary Commendation.

To *Odontoglossum* × 'Peter' (parentage unrecorded), from Messrs. Flory & Black. Flower white, with dark chocolate marking.

Cultural Commendation.

To Mr. W. H. White, orchid-grower to Pantia Ralli, Esq., for *Odontioda* × *keighleyensis*, with six branched spikes of scarlet flowers.

Other Exhibits.

Dr. Lacroze, Roehampton: *Odontioda* × *Gratrixiae*, Bryndir variety (**A.M.** May 2, 1916).

Messrs. Flory & Black: hybrid Odontoglossums and Cypripediums.

Messrs. Sander: a group including very interesting species.

Messrs. Stuart Low: *Brassocattleya* × 'Penelope.'

Baron Bruno Schröder: flowers of *Cypripedium* × 'Eurybiades,' 'The Baroness,' and *C.* × 'Eurybiades,' the Dell variety.

Orchid Committee, January 30, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and eleven members present.

No awards were made on this occasion.

Exhibits.

Messrs. Armstrong & Brown, Tunbridge Wells: seedling Odontoglossums and Odontiodas.

Messrs. Charlesworth, Haywards Heath: Odontoglossums and Cattleyas.

Messrs. Sander, St. Albans: hybrids.

Messrs. Hassall, Southgate: Cymbidiums.

Baron Bruno Schröder: *Cypripedium* × 'Eurybiades' *Shillianum.*

Orchid Committee, February 13, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid Odontoglossums and Odontiodas.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums and Laeliocattleyas.

Award of Merit.

To *Laeliocattleya* × 'Trident' (*L.* × 'Diana' × *C. Trianae Backhouseana*) (votes 11 for, 0 against), from Messrs. Flory & Black, Slough. A showy hybrid, in which the mauve-purple band up the petals of *C. Trianae* is extended in a remarkable degree. Sepals cream white, tinged with rose; petals white, with the inner three-fourths flaked with mauve-purple; lip ruby-red, with yellow base.

Preliminary Commendation.

To *Odontoglossum* × 'Alcibiades' (*eximium* × hybrid unrecorded). Flowers large, white, with the inner halves of the segments densely blotched with claret colour. From Messrs. Armstrong & Brown.

Cultural Commendation.

To Messrs. Armstrong & Brown for a fine specimen of the dwarf *Epidendrum polybulbon* and another of its variety, *album*, the latter having pale-yellow flowers with white lip. Each bore over 100 flowers.

Other Exhibits.

Dr. Miguel Lacroze: *Laeliocattleya* × 'Santa-Fé' (*L.-c.* × 'Copia,' × *C.* × 'Enid').

C. B. Haywood, Esq.: *Cypripedium* × 'Mary' (parentage unrecorded).

J. Ansaldo, Esq., Mumbles: hybrid *Cypripedium.*

Messrs. Sander: *Laeliocattleya* × 'Sir Douglas Haig' (*C.* × 'Octave Doin' × *L.-c.* × 'Henry Greenwood').

Messrs. Flory & Black: *Sophrolaeliocattleya* × 'Myra' (*L.-c.* × 'Myra' × *S.-l.-c.* × 'Althea').

ORCHID COMMITTEE, FEBRUARY 27, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and ten members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

First-class Certificate.

To *Eulophiella* × *Rolfei* (*Elisabethae* × *Peetersiana*) (votes unanimous), from Messrs. Charlesworth. A remarkable hybrid, having the white *E. Elisabethae* as the seed-bearer, but with the habit and colour of *E. Peetersiana*. Inflorescence 3 feet, stout, dark in colour, as in *E. Elisabethae*. Flowers 3 inches across, of thick substance, all the segments broad. Sepals and petals deep rosy-mauve. Lip white, with mauve apex. From the fertilization of the flower to the germination of the seeds only three months elapsed.

Award of Merit.

To *Miltonia* × 'Venus' (*vexillaria* × *Phalaenopsis*) (votes unanimous), from Messrs. Charlesworth. *M. vexillaria* was the seed-bearer, and in the habit of the plant and arrangement of the parts of the flower it predominates. The lip, however, much resembles that of *M. Phalaenopsis*. Sepals and petals tinged with rose. Lip white, yellow at the base, the middle bearing ruby-red and purple markings.

To *Cymbidium insigne album* (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. The first albino of the well-known type which bears vinous purple markings on the sepals, petals, and lip. In the variety shown no colour was visible.

To *Odontioda* × 'Joan,' Broadlands variety (*Oda.* × *Charlesworthii* × *Odm.* × *ardentissimum*) (votes unanimous), from E. R. Ashton, Esq., Broadlands, Camden Park, Tunbridge Wells. Flowers deep chocolate-red, with ruby-red spotting on the lip.

Preliminary Commendation.

To *Odontioda* × Madeline' var. 'Opal' (*Oda.* × *Charlesworthii* × *Odm. crispum*), from Messrs. Armstrong & Brown. The flower was ruby-claret, with a slight gold tint and of good form.

Other Exhibits.

Messrs. Flory & Black: *Brassolaeliocattleya* × *Harrisonii* (*L.-c.* × 'Juno' × *B.-c.* × 'Mrs. J. Leemann').

Messrs. Stuart Low: three hybrids.

ORCHID COMMITTEE, MARCH 13, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended:—

Silver Flora Medal.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey (gr. Mr. Collier), for Dendrobiums.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums, Odontiodas, and Laeliocattleyas.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums and Odontiodas.

First-class Certificate.

To *Laeliocattleya* × 'General Maude' (*L.-c.* × 'Rubens' *Lambeauiae* × *C. Hardyana*) (votes unanimous), from Messrs. Charlesworth. A noble flower borne on a plant of dwarf habit. Sepals and petals broad, rosy-mauve, with darker veining. Lip broad, ruby-purple, with a yellowish base.

Award of Merit.

To *Laeliocattleya* × 'Serbia' var. 'The President' (*L.-c.* × 'St. Gothard' × *C.* × 'Enid') (votes unanimous), from Messrs. Charlesworth In the fine flower of the plant shown, *C. Warneri*, obtained through *L.-c.* × *Gottoiana*, one of the parents of *L.-c.* × 'St. Gothard,' was the prevailing feature. Sepals and petals bright rose. Lip ruby-crimson, with yellow disc and lines from the base.

Preliminary Commendation.

To *Odontoglossum* × *exultans* var. 'Vulcan' (*excellens* × *Ossulstonii*), from Messrs. Armstrong & Brown. Flower dark chocolate-red, with pale-yellow margins and tips to the segments. Lip white, with yellow crest and chestnut-red blotch.

Other Exhibits.

Sir Jeremiah Colman, Bt.: fine hybrid Dendrobiums raised at Gatton Park.

Pantia Ralli, Esq.: *Cattleya* × 'Apelles' (× *Whitei* × *Mendelii* 'King George V.').

Messrs. Sander: hybrids and rare species.

Messrs. Flory & Black, Slough: Odontoglossums and the white *Cattleya* × 'Suzanne Hye de Crom.'

Orchid Committee, March 27, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and eighteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for spring-flowering Dendrobiums.
To Messrs. McBean, Cooksbridge, for hybrid Cymbidiums.

First-class Certificate.

To *Cypripedium* × 'Eurybiades' 'The Baron' ('Hera Euryades' × 'Alcibiades') (votes unanimous), from Mr. J. E. Shill, The Dell Gardens, Englefield Green. A very large flower with white dorsal sepal, having a green base and profusion of spotted purple lines. Lip and petals yellow, tinged with mahogany-red.

Award of Merit.

To *Brassocattleya* × 'Lady Jellicoe' (*B.-c.* × *Digbyano-Schroederae* × *C. Gaskelliana albens*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. A perfect white flower, with slight rose tint on the sepals, and yellow disc to the fringed lip.

To *Sophrolaeliocattleya* × 'Meuse' var. 'General Nivelle' (*S.-l.-c.* × 'Marathon' × *L.-c.* × *callistoglossa*) (votes unanimous), from Messrs. Charlesworth. Sepals and petals reddish-rose, with a gold tint. Lip crimson, with yellow lines from the base. The best of the three varieties shown; all different.

To *Cattleya* × 'Enid' var. 'Silver Queen' (*Mossiae Reineckiana* × *Warscewiczii* var. 'F. M. Beyrodt') (votes 10 for, 5 against), from Messrs. Charlesworth. A large, pure white flower, with some purple lines in front of the yellow disc of the lip.

To *Odontioda* × 'St. Quentin' (*Oda.* × 'Zephyr' × *Odm.* × *Wiganianum*) (votes unanimous), from Messrs. Flory & Black, Slough. Flowers pale yellow, spotted on the inner parts of the segments with dark red. Front of the lip blush-white, with a dark red band in the centre.

Other Exhibits.

Mrs. Bischoffsheim: *Brassolaeliocattleya* × 'Queen of the Belgians,' Warren House variety.

C. J. Lucas, Esq.: two new hybrid Odontoglossums.

W. Evans, Esq.: *Dendrobium nobile* varieties.

Messrs. Sander: a group.

Messrs. Flory & Black: hybrids.

Messrs. Armstrong & Brown: new Odontoglossums and Odontiodas.

ORCHID COMMITTEE, APRIL 11, 1917.

FREDERICK J. HANBURY, Esq., in the Chair, and eight members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for a group of hybrid Odontiodas and Odontoglossums.

First-class Certificate.

To *Odontioda* × 'Coronation,' Orchidhurst variety (parentage unrecorded) (votes 5 for, 1 against), from Messrs. Armstrong & Brown. Darker in colour and slightly larger in size than the original, for which Mons. Chas. Vuylsteke received a **F.C.C.** May 23, 1911. The flowers of the Orchidhurst variety are over three and a half inches across; the ground colour blush-white, the inner parts of the segments blotched with dark red, and the margins tinged with purple. The parentage is probably *Odontioda* × *Vuylstekeae* crossed with a hybrid Odontoglossum. The fine plant shown bore a four-branched inflorescence of forty-nine flowers.

Other Exhibits.

Mr. J. E. Shill, The Dell Gardens, Englefield Green: *Cattleya* × 'Lady Rowena' (*Warneri alba* × 'Suzanne Hye de Crom').

Messrs. Charlesworth, Haywards Heath: Laeliocattleyas &c.

Messrs. Sander, St. Albans: white Cattleyas and hybrids.

Messrs. Stuart Low, Jarvisbrook: Laeliocattleyas and cut spikes of Vandas.

ORCHID COMMITTEE, APRIL 24, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums and Odontiodas.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for Laeliocattleyas &c.

Preliminary Commendation.

To *Odontoglossum crispum* var. 'Dreadnought' (votes unanimous), from Messrs. Armstrong & Brown. Obtained by crossing two blotched forms of *O. crispum*, and resulting, as is often the case, in the blotching being merged into an almost self-coloured flower. Sepals and petals bright reddish-claret in various shades, margin white.

To *Odontoglossum* × 'Rex' (*crispum* × hybrid unrecorded) (votes unanimous), from Messrs. Armstrong & Brown. Flower large and of fine shape, white, blotched in the inner parts with purple.

Other Exhibits.

Messrs. Sander, St. Albans: species and hybrids.

Messrs. Armstrong & Brown: *Miltonia* × *Hyeana sandhurstiensis* and other hybrid Miltonias.

Orchid Committee, May 8, 1917.

Sir Harry J. Veitch in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums &c.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums and Laeliocattleyas.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Mr. C. F. Waters, Balcombe, for Dendrobiums.

Award of Merit.

To *Dendrobium* × *illustre* var. 'Florence Bartels' (*Dalhousieanum* × *chrysotoxum*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier). Habit of *D. Dalhousieanum*. Flowers cowslip yellow, with a veined blotch of claret colour on each side of the lip. The original, shown by Messrs. Jas. Veitch, obtained a **F.C.C.** June 25, 1895.

To *Selenipedium caudatum Sanderae* (votes 6 for, 3 against), from Messrs. Sander, St. Albans. Near to *S. caudatum Wallisii*, and said to be identical with the type *Cypripedium* (*Selenipedium*) *caudatum*, not now in gardens. Flowers green, with white showing between the veining of the long sepals and petals.

To *Odontioda* × 'Cardinal' (parentage unrecorded) (votes unanimous), from Baron Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flowers rose-tinted, with deep red blotches on the segments. Front of lip white.

Preliminary Commendation.

To *Odontoglossum crispum* var. 'President Wilson' (votes unanimous), from Messrs. Armstrong & Brown. A large white flower, heavily blotched with claret-red.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Dendrobium* × *illustre Bartelsianum* and *Odontoglossum* × *Thompsonianum pallidum*.

Leonard Dixon, Esq., St. Albans: *Odontioda* × *Charlesworthii* var.

Messrs. Stuart Low: hybrids.

Orchid Committee, May 22, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Miltonias, Odontoglossums, &c.

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new Odontoglossums.

To Messrs. Cypher, Cheltenham, for a group of sixty species and hybrids.

To Messrs. McBean, Cooksbridge, for Laeliocattleyas and other hybrids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for many interesting species.

To Messrs. Stuart Low, Jarvisbrook, for a group including *Renanthera Imschootiana.*

Award of Merit.

To *Odontioda* × 'General Haig' (*Odm.* × 'Aglaon' × *Oda.* × *Vuylstekeae*) (votes 16 for, 0 against), from Messrs. Armstrong & Brown. Flowers large cream white, blotched with Indian red, margins light violet. The spike bore sixteen flowers.

Preliminary Commendation.

To *Odontoglossum* × 'Fabia' *splendens* (× 'Aglaon' × *eximium*) (votes 14 for, 1 against), from Messrs. Armstrong & Brown. Flower large, dark claret-purple, with white margin.

Other Exhibits.

Sir Jeremiah Colman, Bt.: scarlet Odontiodas.
Baron Bruno Schröder: Laeliocattleyas.
G. W. Bird, Esq.: *Odontioda* × 'Gladys' var. 'Famille Rose.'
Messrs. Flory & Black: *Odontioda* × 'St. Quentin.'

Orchid Committee, June 5, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new hybrids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for *Cattleya Mossiae* and hybrids.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for Laeliocattleyas.

Award of Merit.

To *Miltonia vexillaria* var. 'Sir Mervyn Buller' (var. 'Memoria G. D. Owen' × var. *Leopoldii*) (votes 11 for, 0 against), from Messrs. Armstrong & Brown. Flower bright rose. Labellum 4 inches across, with an ornate triangular mask of deep maroon at the base.

To *Cypripedium niveum*, The Grange variety (votes unanimous), from Philip Smith, Esq., Manor House, Ashton-on-Mersey (gr. Mr. Thompson). Flowers larger than the type, pure white, with minute purple spotting on the bases of the petals and lip.

Cultural Commendation.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bt., for a fine specimen of *Dendrobium acuminatum*, with six spikes of rose-pink flowers with darker centres.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Saccolabium ampullaceum.*
Dr. Miguel Lacroze: Laeliocattleyas
R. Brooman White, Esq.: Odontoglossums.

ORCHID COMMITTEE, JUNE 19, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended:—

Williams Gold Medal.

To Messrs. Charlesworth, Haywards Heath, for a fine group of home-raised Miltonias.

Silver-gilt Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Miltonias and Odontoglossums.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for Cattleyas, Laeliocattleyas, &c.
To Messrs. Stuart Low, Jarvisbrook, Sussex, for Laeliocattleyas &c.

Award of Merit.

To *Miltonia* × 'Princess Mary' (*Hyeana* × *Bleuana*) (votes unanimous), from Messrs. Armstrong & Brown. A large white flower, with a tinge of lilac on the petals and a broad purplish-rose mask at the base of the lip.

To *Odontioda* × 'The Prince' (*Oda.* × *Charlesworthii* × *Odm.* × *Adriano-triumphans*) (votes unanimous), from G. W. Bird, Esq., The Manor House, West Wickham (gr. Mr. Redden). Flowers resembling *Odontoglossum crispum*; pale lilac-purple.

Preliminary Commendation.

To *Miltonia* × 'Fairy Queen' ('Princess Mary' × *vexillaria* 'Memoria G. D. Owen') (votes unanimous). The seedling plant bore one large pure white flower, with triangular, ruby-crimson mask on the lip. From Messrs. Armstrong & Brown.

To *Odontoglossum* × 'Felicity' ('Olympia' × *ardentissimum*) (votes unanimous), from Messrs. Charlesworth. A large white flower of fine shape, with clusters of red-brown blotches in the middles of the segments.

Other Exhibits.

G. W. Bird, Esq.: *Odontioda* × 'Aurora.'
Walter Cobb, Esq.: *Laeliocattleya* × 'Ceres.'
C. J. Lucas, Esq.: Odontoglossum hybrids.

NARCISSUS AND TULIP COMMITTEE.

FEBRUARY 17, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seven members present.

The only exhibit before the Committee was a batch of *Tulipa Kaufmanniana ryensis,* from Messrs. Herbert Chapman, Ltd., Rye. All the plants staged were the descendants of one bulb, and the Committee considered they represented the original species as certificated in 1897.

The Rev. Joseph Jacob gave notice of motion, "That on March 13, 1917, the Committee appoint Schedule, Publications, and Classification Sub-Committees."

NARCISSUS AND TULIP COMMITTEE, FEBRUARY 27, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seven members present.

At the suggestion of Mr. F. H. Chapman it was agreed that a letter be sent from the Committee to Col. Hugh V. Warrender, congratulating him upon the receipt of the Distinguished Service Order.

Award Recommended :—

Silver Banksian Medal.

To Messrs. R. H. Bath, Wisbech, for a group of Daffodils.

NARCISSUS AND TULIP COMMITTEE, MARCH 13, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and twelve members present.

In accordance with notice of motion the Committee proceeded to elect Sub-Committees, as follows :—

Schedule Sub-Committee.—Rev. G. H. Engleheart, Rev. J. Jacob, Messrs. Walter T. Ware, Peter R. Barr, P. D. Williams, W. B. Cranfield, G. W. Leak, Herbert Smith, J. D. Pearson, and Geo. Monro, junr., and the Chairman and Hon. Sec.

Publications Sub-Committee.—Rev. G. H. Engleheart, Rev. Canon Fowler, Rev. J. Jacob, Miss Willmott, Messrs. J. T. Bennett Pöe, J. D. Pearson, Peter R. Barr, and G. W. Leak, and the Chairman and Hon. Sec.

Classification Sub-Committee.—Rev. W. Wilks, Rev. Joseph Jacob, Rev. G. H. Engleheart, Messrs. J. T. Bennett Pöe, Peter R. Barr, A. M. Wilson, Walter T. Ware, E. M. Crosfield, J. D. Pearson, and G. W. Leak, and the Chairman and Hon. Sec.

A list of Judges for the Daffodil Show was drawn up for the consideration of the Council.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Bath, for a large display of Tulips and Daffodils grown in fibre.

Bronze Banksian Medal.

To Mr. G. W. Miller, Wisbech, for a group of Daffodils.

NARCISSUS AND TULIP COMMITTEE, MARCH 27, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and twelve members present.

It was agreed that the voting for the award of the Peter Barr Memorial Cup should take place on April 17, and that members be notified accordingly.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Bath, for a group of Tulips grown in fibre.

Silver-gilt Banksian Medal.

To Messrs. Bath, for a group of cut Daffodils.

To Messrs. J. R. Pearson, Lowdham, for a group of Daffodils which included many white Trumpet and Giant *Leedsii* varieties.

Award of Merit.

To Narcissus 'Bonaparte' for pot cultivation (votes 9 for, 0 against); an *Incomparabilis* variety, with flattish sulphur-yellow perianth, and a broad, frilled trumpet of deeper hue. From Messrs. Barr, Covent Garden.

NARCISSUS AND TULIP COMMITTEE, APRIL 11, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and eight members present.

Owing to the extreme lateness of the season, and various difficulties incidental to war time, the question of holding the London Daffodil Show was discussed. Members of Committee and other Fellows had written, some urging the postponement of the Show and others suggesting its abandonment. On the motion of the Rev. G. H. Engleheart and Mr. Peter R. Barr, the following resolution was adopted unanimously :—"That the Narcissus and Tulip Committee request the Secretary, Rev. W. Wilks, to advise the Council to abandon the Daffodil Show fixed for April 17." To this the Council agreed.

* Concerning Mr. J. K. Ramsbottom's lecture on "Investigations in the Daffodil Disease," arranged to be given during the afternoon of the Daffodil Show, the Hon. Sec. was requested to endeavour to arrange for the lecture to be delivered at the Horticultural Club, as it was of great importance that the latest information should be made public as early as possible.

* See p. 51.

Awards Recommended :—

Gold Medal.

To Messrs. Bath, for a very extensive and unusually fine group of Darwin Tulips grown in fibre.

Silver-gilt Banksian Medal.

To Messrs. Barr, for a group of Daffodils grown in the open at Gulval, Penzance.

NARCISSUS AND TULIP COMMITTEE, APRIL 24, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and ten members present.

According to the second notice given, the voting for the Award of the Peter Barr Memorial Cup took place at this meeting. The award was made unanimously in favour of Mr. Walter T. Ware, of Inglescombe, Bath, who will hold the Cup for one year.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, for a large group of cut Daffodils containing new seedlings and modern varieties as well as older standard varieties.

Silver gilt-Banksian Medal.

To Messrs. Dobbie, Edinburgh, for a display of Tulips.

Award of Merit.

To Narcissus 'Michael' (votes 8 for, 1 against), a handsome Trumpet variety of large size, fine form, and solid, golden yellow colouring. Raised by Mr. J. C. Williams; shown by Messrs. Barr.

NARCISSUS AND TULIP COMMITTEE, MAY 8, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seventeen members present.

The Hon. Sec. reported the receipt of a letter from Mr. Walter T. Ware, thanking the Committee for voting him the Peter Barr Memorial Cup for the ensuing year.

Members reported the death of Miss F. Currey, a former member of the Committee; of Mr. Worsley, of Clifton; and of Baron de Soutellinho, of Oporto. The Hon. Sec. was requested to write letters of condolence to the bereaved families.

The Chairman read a letter received from Major Hugh Warrender, thanking the Committee for their letter congratulating him upon the receipt of the Distinguished Service Order.

There was a splendid display of Daffodils on this occasion, eight groups being staged and fifteen novelties submitted for award.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Bath, for cut Daffodils.

Silver-gilt Banksian Medal.

To Mr. J. K. Ramsbottom, R.H.S. Gardens, Wisley, for an exhibit illustrating his investigations in the Daffodil disease.

To Messrs. Pearson, Notts, for cut Daffodils.

To Messrs. Barr, for cut Daffodils.

Silver Banksian Medal.

To Mr. George Churcher, Alverstoke, for Daffodils.

Award of Merit.

To Narcissus 'Queen of Dawn' (votes 8 for, 0 against), a finely formed *Barrii* variety (3*b*) with broad, creamy, pink-tinged perianth segments and a frilled orange-red cup. From Messrs. Barr.

To Narcissus 'Vintage' (votes 14 for, 0 against), a charming hybrid derived from 'King Alfred,' crossed with *Narcissus calathinus*; the large, slightly frilled trumpet and the flat perianth are wholly citron-yellow. The flowers large, drooping, and very graceful. From Messrs. Herbert Chapman.

To Narcissus 'Helmet,' for show purposes (votes 11 for, 2 against), a very giant among Giant *Leedsii* varieties. Flowers five inches across, cream white, with a green base to the frilled trumpet. From Mr. W. B. Cranfield, Enfield Chase.

To *Narcissus poeticus ornatus plenus* (votes 12 for, 0 against), a pure white, sweetly scented and double form of the popular *Narcissus poeticus ornatus*. Should prove very useful for market purposes. From Messrs. J. Culpin, Spalding.

Narcissus and Tulip Committee, May 22, 1917.

Mr. E. A. Bowles, V.M.H., in the Chair, and eleven members present, with Mr. C. W. Needham as visitor.

Awards Recommended :—

Gold Medal.

To Messrs. Dobbie, for a group of late Tulips.

Silver-gilt Flora Medal.

To Messrs. Barr, for a group of late Tulips.

To Mr. A. D. Hall, Merton, for Old English Tulips.

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for Tulips.

To Messrs. R. Wallace, Colchester, for late Tulips.

To Messrs. Bath, for Tulips.

Silver Flora Medal.

To Mr. W. Peters, Farcet House, Cambridge, for Old English Tulips.

NARCISSUS AND TULIP COMMITTEE, JULY 3, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seven members present.

The Committee met at the Horticultural Club, Hotel Windsor, at 10.30 A.M., to consider the Daffodil Show, Daffodil Year Book, &c., for the ensuing year.

It was agreed "That the Council be asked to reserve space especially for Daffodils at the meeting to be held on April 23, 1918, but that no schedule be issued and no prizes offered." It was also agreed "That while continuing to collect material for a Year Book, the Committee does not consider it desirable to publish a Daffodil Year Book in 1917." The Council subsequently agreed to these recommendations.

Mr. Peter R. Barr, Treasurer of the London Daffodil Show Prize Fund, reported a balance in hand of £165 14*s*., all of which he had placed on deposit at the bank.

The Hon. Sec. reported that through the kindness of the British Wholesale Florists' Federation he would be able to send a reprint of Mr. J. K. Ramsbottom's lecture to each Member of Committee.

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ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W. 1.

NOTICES TO FELLOWS.

1. Important Notices.
2. Chelsea and Holland House.
3. Subscriptions.
4. Form of Bequest.
5. New Fellows.
6. An Appeal.
7. The Society's Gardens at Wisley.
8. Students at Wisley.
9. Distribution of Surplus Plants.
10. Dutch Brown Bean.
11. National Diploma in Horticulture.
12. Examinations, 1918.
13. Information.
14. Inspection of Fellows' Gardens.
15. Affiliation of Local Societies.
16. R.H.S. Gardeners' Diary.
17. Rules for Judging—1914 Code.
18. Food Production Publications.
19. R.H.S. Pamphlets.
20. List of the Most Desirable Fruits.
21. Fruit Bottling for Cottagers.
22. Book on Fruit Bottling.
23. R.H.S. War Relief Fund.
24. Shirley Poppy Seed.

I. IMPORTANT NOTICES.

1. The Society's Hall in Vincent Square being still occupied by the Australian Imperial Force, the Fortnightly Meetings will continue to be held in the London Scottish Drill Hall, Buckingham Gate, Victoria Street. It is hoped that Fellows will do their utmost to support these Meetings during their temporary transference to the Drill Hall.

2. The Lectures will be given at the Drill Hall.

3. The Society's Offices and Library will continue in Vincent Square as heretofore. The Scientific Committee will also meet as before at Vincent Square.

2. CHELSEA AND HOLLAND HOUSE SHOWS.

The Council greatly regret that War conditions do not permit of the resumption of the Chelsea and Holland House Meetings in 1918. It will be remembered that they had to be abandoned last year on patriotic grounds which are even more imperative this year. Floral, Fruit, and Vegetable Meetings will, however, be held at the Drill Hall on the same dates.

3. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the inconvenience of remembering their subscriptions, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W. 1."

4. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

5. NEW FELLOWS.

The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as, owing to the great increase in work which has fallen upon, or been voluntarily undertaken by, the Society, it is now more important than ever to fill the places of those who are taken from us. A letter on this subject was sent to all the Fellows in December last. Should any Fellow have failed to receive it, another copy will be sent on application to the Secretary, R.H.S., Vincent Square, London, S.W. 1.

6. AN APPEAL.

What has been accomplished for the Society is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests especially by:—

1. Increasing the Number of Fellows.
2. Presenting Books for the Library at Vincent Square and at Wisley.
3. Sending new or rare Plants, Seeds, and Roots for the Garden and for distribution to Fellows, and for helping to keep the Hospital Camps in France and Flanders, &c., furnished.

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* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to complete this sum?

7. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the 1914 Annual Meeting for the further development of the practical and scientific work at Wisley, the Council were fortunate in securing the services of Dr. Keeble, F.R.S., as Director. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of the Society and the Imperial College. All communications to the Gardens should be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till 6 P.M., except on Sundays, Good Friday, Christmas Day, and Meeting Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*; or to and from Horsley or Byfleet, 7*s.* Motor cars can be had at Byfleet Station by applying to Mr. Finch, The Garage, Byfleet, Surrey. Accommodation and refreshments can be had at the Hut Hotel close to the Gardens, and also at the Hautboy, Ockham.

8. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

9. DISTRIBUTION OF SURPLUS PLANTS.

Some years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive those surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows who had paid the current year's subscriptions the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to return their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden

cannot be disorganized by the sending out of plants at any later time in the year. All Fellows who have paid the current year's subscription can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. Owing to the railways declining to deliver these parcels any longer, they *must* now be sent by post, the postage being prepaid by Fellows. Directions as to the amount of the remittance to be sent will be found on the application form for plants, which kindly consult before sending it in.

Parcels will be addressed exactly as given by each Fellow on the address label accompanying his application form.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

10. THE R.H.S. DUTCH BROWN BEAN.

This Dutch Brown Bean of the Haricot type, introduced to Great Britain by the Society and distributed in the Spring of 1917 has succeeded beyond all expectations, both in its cropping qualities and its popularity as a table vegetable for the winter months. The harvest secured at Wisley will be distributed to Fellows in 1918 through the usual channel of the Plant and Seed distribution. Fellows are urged to distribute their 1917 crop to their friends for sowing in the coming Spring, or to send it to the R.H.S. Gardens, Wisley, Ripley, Surrey, for distribution to other Fellows.

11. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words : "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations which are held in June are practical, *viva voce*, and written ; the practical part being held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W. 1.

12. EXAMINATIONS, 1918.

A syllabus of the different examinations can be obtained from the Society's Office, Vincent Square, S.W. 1, post free for 2½*d.*

13. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. 1.* Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

14. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz. : a fee of £3 3*s.* for one day (or £5 5*s.* for two consecutive days),

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* *See* R.H.S. Gardeners' Diary, 1918, page 68—"How to send Specimens for Identification."

together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the *owner*.

15. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.

Numerous requests for help having recently reached the Secretary from the Allotment and Cottagers' Societies now springing up all over the Kingdom, the President and Council have responded by revising and extending the benefits offered to Affiliated Societies. It is hoped that all Societies will by Affiliation become united with the parent Society and through it with each other. Such a unity cannot fail to be attended with good and progressive results.

16. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1918 contains a considerable quantity of new information and is compiled more especially for the single-handed gardener. Fellows may obtain it from the R.H.S. Office, Vincent Square, London, S.W. 1; bound in art paper covers, without pencil, 1*s.* 3*d.*, in cloth similar to the 1917 Edition, with pencil, 1*s.* 9*d.*, in leather, 2*s.* 3*d.*; post free.

17. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 9*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W. 1.

18. R.H.S. FOOD PRODUCTION PUBLICATIONS FOR THE ASSISTANCE OF COTTAGE AND ALLOTMENT GARDEN SOCIETIES.

To assist the rapidly growing army of Allotment Holders and Cottage Gardeners the Society has had the following publications prepared :—

	Post free. *s.*	*d.*
Rules and Regulations for Allotment Societies		2
Rules for Judging Cottage and Allotment Gardens		2
Companion Judges Sheet for ditto		3
Rules for Allotment and Vegetable Exhibitions		2
Vegetable Bottling and Fruit Preserving without Sugar, by Mr. and Mrs. Banks (including valuable recipes for Jams and Jellies)	1	2

Printed lectures, illustrated with lantern slides, have been prepared for the use of Societies of Allotment Holders. For particulars apply to the Secretary, R.H.S. Vincent Square, S.W. 1.

19. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. 1. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. The enormous increase in the cost of paper and printing has entailed a revision of the price of these Pamphlets which until further notice will be as follows :—

Single Copy, 4*d.*; 25, 7*s.* 6*d.*; 50, 14*s.*; 100, 26*s.*, post free.

FOOD PAMPHLETS :—

(*e*) Vegetables and How to Grow Them.
(*f*) Vegetables from Seed sown in July and August.
(*q*) The Cultivation and Manuring of the Garden.
(*r*) Potatos in Gardens and Allotments.

(*v*) Cropping Allotments and Small Gardens.
(*a*) List of Hardy Fruits, with Cultivation.
(*c*) The Pruning of Fruit Trees.
(*b*) The Training of Fruit Trees.
(*d*) Keeping Fruit Trees Clean.
(*k*) Fruit and Vegetable Bottling and Storing.
(*m*) Vegetable Cookery.
(*n*) Salads and Salad Making.

OTHER GARDEN PAMPHLETS :—

(*g*) The Herbaceous Garden.
(*h*) The Rose Garden.
(*i*) Flowers for Small Gardens, Window Boxes, etc.
(*j*) Hardy and Half-Hardy Annuals in the Open Air.
(*o*) War-time Economy in Gardening.
(*p*) Medicinal Plants and their Cultivation.
(*s*) Fruit Cultivation under Glass.
(*t*) The Pruning of Hardy Shrubs.
(*u*) The Children's Garden.

200,000 of these Pamphlets have been sent out during 1917, making nearly 300,000 issued in all.

20. LIST OF THE MOST DESIRABLE VARIETIES OF FRUIT.

DRAWN UP BY THE FRUIT COMMITTEE.

Orders for this list may now be given. Its price is 2*s*. post free. It contains nearly 200 pages, and besides the original list drawn up by the Committee, it gives lists of varieties recommended by nearly 100 expert growers and gardeners all over the country for their respective geographical divisions of Great Britain. The list shows the result of a ballot as to which varieties are to be preferred from such points of view as vigour of constitution, and for various types of growth and cultivation, as, *e.g.*, in the case of Apples—Bush, Standard, Espalier ; Pears—Bush, Standard, Espalier, Wall. It also shows the best varieties for cooking as distinct from dessert, the best for markets, and much similar detailed information which must prove of great help in these days when the planting of more fruits as well as of more vegetables is so widely recognized as being of urgent necessity.

21. FRUIT BOTTLING FOR COTTAGERS.

A leaflet for the use of cottagers and small householders, on Fruit Bottling, has been prepared by the Secretary for free circulation. It can be had on application to the R.H.S. Office, Vincent Square, Westminster, S.W. 1, accompanied by a halfpenny *stamped* and *addressed* envelope. Owing to shortness of staff, any application not thus made cannot receive attention.

22. BOOK ON FRUIT AND VEGETABLE BOTTLING.

Fellows of the Society have shown exceptional interest in the long series of lectures given during this year at the Fortnightly Meetings by Mr. and Mrs. Vincent Banks on Fruit and Vegetable Bottling, who have now, in response to many requests, prepared a book on the subject. The Council, recognizing the value of the information it contains, and the demand for instruction of this kind, have published it. It contains the most up-to-date information on the subject and is most practical. It deals not only with the Bottling of both Fruits and Vegetables, but also with the making of Jam, and the pulping of Fruit to be made into Jam later on, when sugar supplies are more abundant than they are just now. There are also many useful household recipes, and all the information given is the result of the actual experience of the authors extending over a long number of years. Mr. and Mrs. Banks' exhibits of Bottled Fruits at the Society's Meetings are well known to the Fellows for their excellence. The price of the book, which may be obtained from the R.H.S., Vincent Square, London, S.W. 1, is 1*s*., post paid 1*s*. 2*d*. ; bound in stiff paper covers.

The 1918 Edition contains a Supplement on Drying and Canning.

23. R.H.S. WAR RELIEF FUND.

The work of the Society having greatly increased since the outbreak of the War and the staff having greatly diminished, the Council found that the management of this fund imposed far too great a demand upon the staff, a demand indeed which it was impossible to meet. A special Administrative Committee for the War Relief Fund was, therefore, appointed. The Committee is composed of Members of the Council, and of the Ladies' Executive Committee which has done such admirable work in collecting money for the fund. The Office of the Fund is at 17 Victoria Street, Westminster, S.W. 1, where all communications and donations should be addressed.

24. SHIRLEY POPPIES.

Owing to the great increase in the Society's work both in itself and on behalf of the Increase of Food Production of the Government, Mr. Wilks is unable to undertake the distribution of Poppy Seed this year. He has, therefore, given all his 1917 crop of seed to the Society, and it will be found listed with the other seeds in the Annual Distribution which takes place in March and April.

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EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JULY 3, 1917.

Mr. F. J. HANBURY in the Chair.

Fellows elected (22).—F. Agar, A. Allum, Miss M. D. Barlow, W. Barrett, G. P. Harris, C. H. Hawkins, A. Hide, S. E. Higgins, Lady Violet Horden, Mrs. I. Naylor, H. R. Oubridge, Admiral Primrose, Lady Rathcreedan, Rev. Rochford-Wade, Mrs. Rochford-Wade, Miss Wilmot Rogers, Hon. Mrs. Sandbach, A. Sandbach, Mrs. Eva Scott, M. Silverston, Mrs. A. C. Towers, George T. Walch.

GENERAL MEETING.

JULY 17, 1917.

Mr. W. H. DIVERS, V.M.H., in the Chair.

Fellows elected (20).—M. Bennetts, Mrs. E. M. Blair, H. W. S. Chilcott, J. M. Crawford, Miss W. Donald, W. Duckworth, R. S. Gardiner, T. Gibbins, F. E. Hibbs, Miss D. G. Howes, J. Huss, Mrs. Jackson, Rev. J. A. McKenzie, T. G. Marlow, F. T. O'Leary, R. F. Parker, Mrs. Spence, J. C. Thomas, F. W. Welch, Rev. G. H. Wilson.

A lecture on "Mildew Resistant Roses" was given by Mr. Walter Easlea (see p. 253).

GENERAL MEETING.

JULY 31, 1917.

Mr. E. A. BUNYARD, F.L.S., in the Chair.

Fellows elected (17).—J. Christmas, J. D. Cormack, F. Evans, Major F. C. Ferguson, C. Gillard, J. F. Harrison, J. A. Lawrenson, W. F. McCash, Mrs. A. L. Morgan, C. H. Oldham, J. Powell, C. E. Salmon, L. Schaverim, W. F. Shaw, Bishop of Southwark, G. E. Wilson, R. F. Wootton.

Affiliated Societies (1).—West Bridgford Allotment Holders' Association.

A lecture on the "Lorette System of Pruning" was given by Dr. H. E. Durham (see p. 261).

EXHIBITION OF HARDY BRITISH-GROWN FLOWER BULBS.

JULY 31, 1917.

Class 3. Amateurs.—Collection of Dry Home-grown Hardy Flower Bulbs, in not more than 20 varieties, of which 7 at least must be Daffodils; and not more than 15 or less than 10 bulbs of any one variety.

First Prize, £2 10s.; Second, £1 10s.; Third, £1.

NOTE.—An exhibitor in Class 3 was not allowed to exhibit in Class 4.

No entries.

Class 4. Amateurs.—Collection of Dry Home-grown Hardy Flower Bulbs, in not more than 10 varieties, of which 5 at least must be Daffodils; and not more than 15 or less than 10 bulbs of any one variety.

First Prize, £2 10s.; Second, £1 10s.; Third £1.

1. G. Stocks, Esq., 44 Bentley Road, Doncaster.
3. Miss V. Warren, The Oaks, Westbere, Canterbury.
No second awarded.

Class 5. Open.—Collection of Dry Home-grown Daffodil Bulbs—'Single' Bulbs, in not more than 20 varieties nor more than 20 bulbs of any one variety; in a space 10 ft. by 3 ft.

Silver-gilt Banksian Medal.
Messrs. J. R. Pearson, The Nurseries, Lowdham.

Silver Flora Medal.
Messrs. Bath, Floral Farms, Wisbech.

Silver Banksian Medal.
Messrs. Hogg & Robertson, 22 St. Mary Street, Dublin.

Bronze Banksian Medal.
Mr. J. Mallender, Scrooby, Bawtry.

Class 6. Open.—Collection of Dry Home-grown Daffodils—'Cluster or Family' bulbs, in not more than 20 varieties nor more than 20 clusters of any one variety.

No entries.

Class 7. Open.—Collection of Dry Home-grown Bulbs of Market Varieties of Daffodils—'Single' Bulbs—in 10 varieties, 20 bulbs of each, to include 'Emperor,' 'Empress,' 'Sir Watkin,' 'Victoria,' '*Barrii conspicuus*,' and '*Poeticus ornatus*,' in a space 7 ft. by 3 ft.

Silver-gilt Banksian Medal.
Messrs. Bath.

Silver Flora Medal.
Mr. Mallender.

Class 8. Open.—Collection of Dry Home-grown Bulbs of Market Varieties of Daffodils—'Cluster or Family' Bulbs—in 10 varieties, 20 clusters of each, to include 'Emperor,' 'Empress,' 'Sir Watkin,' 'Victoria,' '*Barrii conspicuus*,' and '*Poeticus ornatus*.'

No entries.

Class 9. Open.—Collection of Dry Home-grown Tulip Bulbs, in not more than 20 varieties, nor more than 20 bulbs of any one variety, in a space 10 ft. by 3 ft.

Silver-gilt Banksian Medal.
Messrs. J. R. Pearson.

Silver Flora Medal.
Messrs. Geo. Monro, Jr., The Maltings, Spalding, Lincs.

Silver Banksian Medal.
Messrs. Hogg & Robertson.

Silver Banksian Medal.
Messrs. Bath.

Class 10. Open.—Collection of any Dry Home-grown Hardy Flower Bulbs other than Daffodils and Tulips. Not more than 30 varieties, nor more than 30 or less than 20 bulbs of any one variety. Diversity of Genera and Species will be favourably considered by the judges; in a space 12 ft. by 3 ft.

Silver-gilt Banksian Medal.
Messrs. Barr, King Street, Covent Garden, W.C.

Silver Flora Medal.
Messrs. Hogg & Robertson.

GENERAL MEETING.

AUGUST 14, 1917.

Mr. J. CHEAL, V.M.H., in the Chair.

Fellows elected (24).—D. Barnard, Robt. Barr, F. E. Bartlett, E. F. Benton, Miss M. H. Beveridge, A. P. Blacklea, S. W. Chorlton, Herbert Collins, W. H. Cowell, Thomas England, M. Feeney, A. S. Fidler, E. B. Foweraker, James Guy, W. M. Hale, George Hill, C. W. H. Iago, G. E. Millard, L. Morgan, P. R. Morris, Leonard Nichols, Miss G. L. Peirse-Duncombe, F. H. Wheeler, W. Y. Wyndham.

Affiliated Societies (1).—Chadwell Heath Amateur Gardeners' Society.

A lecture was given on "Water Gardening" by Mr. R. W. Wallace (see p. 278).

GENERAL MEETING.

AUGUST 28, 1917.

Mr. E. H. JENKINS in the Chair.

Fellows elected (10).—Miss Bennison, Mrs. Chappell, F. J. Crickland, Mrs. F. A. Crisp, Miss A. Hunt, L. E. Snelgrove, Mrs. F. A. Talbot, T. F. Thorogood, F. M. Vokes, W. R. Williams.

Fellows resident abroad (1).—Lt. Georges Truffaut.

Affiliated Societies (2).—Llandudno Allotment Holders' Association, Sholing Amateur and Cottage Gardeners' Improvement Association.

A lecture on "Guides to the Manuring of Garden Crops" was given by Mr. H. E. P. Hodsoll, F.C.S. (see p. 346).

GENERAL MEETING.

SEPTEMBER 11, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair.

Fellows elected (4).—F. G. Benbow, Miss C. M. Kennedy, J. P. O'Reilly, Thomas Smith.

Affiliated Societies (1).—Foots Cray and North Cray Horticultural Society.

A lecture on "The Planting of Shrubs for Autumn Colour Effects" was given by Mr. C. R. Fielder, V.M.H. (see p. 340).

R.H.S. VEGETABLE MEETING.

SEPTEMBER 25, 1917.

Class 1.—Twelve kinds distinct, to be selected from the subjoined list. Beet, Brussels Sprouts, Cabbage, Broccoli or Cauliflower, Carrots, Celery, Cucumbers, Endive, Leeks Lettuce, Mushrooms, Onions, Parsnips, Peas, Potatos, Tomatos, Turnips, Beans (Runner or French), Vegetable Marrow.

First Prize, The Sutton Challenge Cup (value £21) and £5; Second, £4; Third, £3.

1. W. H. Myers, Esq., Swanmore, Bishops Waltham (gr. G. Ellwood).
2. T. Jones, Esq., Bryn, Penylan, Ruabon.
3. E. Matthews, Esq., Stratfieldsaye, Mortimer R.S.O., Berks.

Class 2.—Nine kinds distinct, to be selected from the list in Class 1. The object of this Class is to illustrate not only those vegetables which are in daily use, but especially the quality and size in which they are most acceptable and useful for table use, and possess the qualities most valued for table use by cooks.

First Prize, The Gordon Lennox Challenge Cup and £4; Second, £3; Third, £2.

1. E. E. Palmer, Esq., Drayton House, Sherfield on Loddon, Basingstoke (gr. H. E. Wallis).
2. Hon. Mrs. Greville, Polesden Lacy, Dorking (gr. H. Prince).
3. Mrs. M. Knox, Hall Hatch, nr. Alton (gr. W. West).

Class 3.—Six kinds distinct, to be selected from the list in Class 1.

First Prize, £3; Second, £2; Third, £1.

1. Miss E. L. Bradshaw, The Grange, Steeple Aston, Oxon. (gr. R. Wadham).
2. G. Thorn, Esq., Sprotlands, Willesborough, Ashford (gr. M. Hoad).
3. Sir M. Turner, Bedfords, Havering, Romford (gr. A. J. Barrett).

Class 4.—Potatos, collection of 12 varieties distinct.

First Prize, £3; Second, £2; Third, £1.

1. J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. C. Page).
2. Mrs. A. Smart, Coverpoint, Llansannan, Abergele (gr. R. Rogers).

Class 5.—Potatos, collection of 6 varieties distinct.

First Prize, £1 10*s*.; Second, £1; Third, 10*s*.

Competitors in Class 4 were not allowed to enter in 5.

1. G. Thorn, Esq.
2. W. H. Myers, Esq.
3. Sir M. Turner.

Class 6.—Onions, collection of 6 varieties distinct, as follows:—

Two dishes of the 'Ailsa Craig' type, one oval and the other round; one dish of Red Onions; one dish of Silverskins; one dish of James' or other selection of long-keeping brown globe Onions; one dish of White Spanish or Nuneham Park type (flat, not globe).

N.B.—More than 2 dishes of selections of 'Ailsa Craig' type, or varieties indistinguishable from it disqualified.

First Prize, £2; Second, £1; Third, 10*s*.

1. W. H. Myers, Esq.
2. E. E. Palmer, Esq.
3. Mrs. Jenner, Wenvoe Castle, nr. Cardiff (gr. H. Wheeler).

Class 7.—Salads, collection of 6 kinds distinct, each kind to be staged separately.

First Prize, £2; Second, £1; Third, 15*s*.

1. W. H. Myers, Esq.
2. Miss Bradshaw.
3. E. Matthews, Esq.

Single Dish Classes for Amateurs.

In Classes 8–38 the First Prize is in each case 10*s*., the Second, 7*s*. 6*d*., Third, 5*s*. The specimens shown in each Class must be always of one and the same variety.

Class 8.—Beans, Scarlet Runners.

1. Miss Bradshaw.
2. Sir M. Turner.
3. Hon. Mrs. Greville.

Class 9.—Beans, French Climbing.

1. E. Matthews, Esq.
2. Mrs. Knox.
3. G. Thorn, Esq.

Class 10.—Beans, French Dwarf.

1. E. Matthews, Esq.
2. Sir M. Turner.
3. Mrs. Knox.

Class 11.—Beet, Globe type.

1. Mrs. Jenner,
2. R. Staward, Esq., The Gardens, Panshanger, Hertford.
3. Miss Bradshaw.

Class 12.—Beet, Long type.

1. Sir M. Turner.
2. E. E. Palmer, Esq.
3. T. Jones, Esq.

Class 13.—Brussels Sprouts, 50 buttons.

1. T. Jones, Esq.
2. W. H. Myers, Esq.
3. Miss Bradshaw.

Class 14.—Brussels Sprouts, 3 plants.

1. R. Staward, Esq.
2. W. H. Myers, Esq.
3. E. Matthews, Esq.

Class 15.—Cabbage.

1. Hon. Mrs. Greville.
2. E. E. Palmer, Esq.
3. G. Thorn, Esq.

Class 16.—Cabbage, Savoy.

1. E. E. Palmer, Esq.
2. Hon. Mrs. Greville.
3. Sir D. Gooch, Bt., Hylands, Writtle, Essex (gr. W. Heath).

Class 17.—Cauliflower or Broccoli.

1. T. Jones, Esq.
2. E. Matthews, Esq.
3. W. H. Myers, Esq.

Class 18.—Celeriac.

1. W. H. Myers, Esq.
2. Miss Bradshaw.
3. R. Staward, Esq.

Class 19.—Celery, white.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. Hon. Mrs. Greville.

Class 20.—Celery, Red.

1. T. Jones, Esq.
2. W. H. Myers, Esq.
3. Hon. Mrs. Greville.

Class 21.—Cucumbers.

1. E. E. Palmer, Esq.
2. T. Jones, Esq.
3. W. H. Myers, Esq.

Class 22.—Leeks.

1. T. Jones, Esq.
2. W. H. Myers, Esq.
3. E. Matthews, Esq.

Class 23.—Marrows.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. R. Staward, Esq.

Class 24.—Mushrooms.

1. Not awarded.
2. Hon. Mrs. Greville.

Class 25.—Onions.

1. Mrs. Jenner.
2. E. E. Palmer, Esq.
3. W. H. Myers, Esq.

Class 26.—Parsnips.

1. Miss Bradshaw.
2. E. E. Palmer, Esq.
3. E. Matthews, Esq.

Class 27.—Carrots, Long.

1. Miss Bradshaw.
2. T. Jones, Esq.
3. E. E. Palmer, Esq.

Class 28.—Carrots, stump-rooted or short.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. E. E. Palmer, Esq.

Class 29.—Peas.

1. E. Matthews, Esq.
2. T. Jones, Esq.
3. E. E. Palmer, Esq.

Class 30.—Turnips, white skin and flesh.

1. T. Jones, Esq.
2. E. E. Palmer, Esq.
3. Mrs. M. Knox.

Class 31.—Turnips, purple-top, red-top, or green-top, flesh white.

1. Miss Bradshaw.
2. Hon. Mrs. Greville.
3. R. Staward, Esq.

Class 32.—Turnips, yellow flesh.

1. T. Jones, Esq.
2. R. Staward, Esq.
3. Sir M. Turner.

Class 33.—Potatos, white.

1. G. Thorn, Esq.
2. E. Matthews, Esq.
3. J. B. Fortescue, Esq.

Class 34.—Potatos, coloured.

1. W. H. Myers, Esq.
2. G. Thorn, Esq.
3. Mrs. M. Knox.

Class 35.—Kale, Curled.

1. E. Matthews, Esq.
2. Hon. Mrs. Greville.
3. E. E. Palmer, Esq.

Class 36.—Tomatos, Red.

1. Miss Bradshaw.
2. G. Thorn, Esq.
3. E. Matthews, Esq.

Class 37.—Tomatos, Yellow.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. R. Staward, Esq.

Class 38.—Any other Vegetable not named in the Schedule.

1. Miss Bradshaw.
2. E. E. Palmer, Esq.
3. Mrs. M. Knox.

CHAMPION CHALLENGE CUP.

The Champion Cup will be held for one year (subject to a guarantee of its return in good condition) by the winner of the greatest number of First Prize points throughout the whole meeting, the winner in Class 1 being excluded. An Exhibitor may win this Cup only once in three years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative Cup. In calculating for this Champion Cup the number of points reckoned for each First Prize will be as follows :

Class 2	9 points
Classes 3, 4	6 ,,
Classes 5, 6, 7	4 ,,
All other classes	1 point

In case of an equality (and only in that case) Second Prizes will be counted in order to arrive at a decision, each Second Prize counting half the points allotted to the First Prize.

Miss Bradshaw, The Grange, Steeple Aston, Oxon. (gr. R Wadham).

GENERAL MEETING.

OCTOBER 9, 1917.

Sir HARRY J. VEITCH, F.L.S., V.M.H., in the Chair.

Fellows elected (41).—R. H. Adie, Mrs. A. Ashworth, H. C. Barnard, T. B. Briggs, S. P. Burghall, J. Campbell, Mrs. W. Campbell, J. B. Clapham, C. E. Coghill, P. Crossley, F. E. Evans, M. W. Fox-Strangeways, A. S. Galt, Miss E. S. Gardner, J. E. Goodson, Miss A. Green, W. J. Hande, M. Harris, C. Hooper, H. Hulland, W. Jones, F. Keeling, J. Kent, F. J. Lume, Miss Martens, H. S. Melbourne, B. Moirer, Major C. A. H. Palairet, Capt. A. Palmer, P. S. Patrick, A. E. Pearse, E. Riddel, W. H. Shankland, T. B. Short, Miss A. Smith, W. B. Tidman, Mrs. E. Tyrwhitt-Drake, Mrs. Walford, H. H. Warner, Lieut.-Col. Wayland, Miss K. M. Wyldes.

Fellows resident abroad (5).—D. C. Amin, H. C. Javaraya, E. Jenkins, D. Newbronner, Miss H. Loines.

Associates (1).—H. Innes.

Affiliated Societies (3).—Harrow and District Allotment Gardeners' Association, Northend Croydon Brotherhood Horticultural Allotment Association, Wealdstone and District Allotment and Food Association.

MEETING FOR BRITISH-GROWN FRUITS, 1917.

OCTOBER 9, 1917.

DIVISION I.

FRUITS GROWN UNDER GLASS OR OTHERWISE.

OPEN TO AMATEURS AND GARDENERS ONLY.

Class 1.—Collection of 9 dishes of ripe dessert fruit :—6 kinds at least ; only 1 Pine, 1 Melon, 1 Black and 1 White Grape, allowed ; not more than 2 varieties of any other kind, and no two dishes of the same variety.

First Prize, Silver Hogg Medal and £5 ; Second, £4 ; Third, £3.

1. Lord Somers, Eastnor Castle, Ledbury (gr. G. Mullins).
2. Duke of Newcastle, Clumber, Worksop (gr. S. Barker).
3. C. A. Cain, Esq., The Node, Welwyn, Herts (gr. T. Pateman).

Class 2.—Collection of 6 dishes of ripe dessert fruit :—4 kinds at least ; only 1 Melon, 1 Black and 1 White Grape, allowed ; not more than 2 varieties of any other kind and no two dishes of the same variety. Pineapples excluded.

First Prize, Silver Knightian Medal and £3 ; Second, £2 ; Third, £1 10*s*.

1. Lord Hillingdon, Wildernesse, Sevenoaks (gr. J. Shelton).
2. E. Matthews, Esq., Stratfieldsaye, Mortimer, Berks.
3. F. R. Rodd, Esq., Trebartha Hall, Launceston (gr. F. A. Billings).

Class 3.—Grapes, 6 distinct varieties (2 bunches of each), of which two at least must be White.

First Prize, Silver Hogg Medal and £5 ; Second, £4 ; Third, £3.

1. Duke of Newcastle.
2. G. Miller, Esq., Newberries, Radlett (gr. J. Kidd).
3. Lord Hastings, Melton Constable, Norfolk (gr. J. G. Besant).

Class 4.—Grapes, 4 varieties (2 bunches of each), selected from the following, 'Madresfield Court,' 'Prince of Wales,' 'Muscat Hamburgh,' 'Muscat of Alexandria' or 'Canon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg.'

First Prize, Silver Knightian Medal and £3 ; Second, £2 ; Third, £1 10*s*.

No entries.

Class 5.—Grapes, 'Black Hamburgh,' 2 bunches.

First Prize, £2 ; Second, £1 10*s*. ; Third, £1.

1. Lord Hillingdon.
2. Duke of Newcastle.
3. E. Matthews, Esq.

Class 6.—Grapes, 'Mrs. Pince,' 2 bunches.

First Prize, £2 ; Second, £1 10*s*.

1. Lord Hillingdon.
2. Duke of Newcastle.

Class 7.—Grapes, 'Alicante,' 2 bunches.

First Prize, £2 ; Second, £1 10*s*.

1. Lord Hillingdon.
2. Lord Somers.

Class 8.—Grapes, 'Madresfield Court,' 2 bunches.

First Prize, £2 ; Second, £1 10*s*.

1. Not awarded.
2. Lord Hastings.

Class 9.—Grapes, 'Prince of Wales,' 2 bunches.

First Prize, £2 ; Second, £1 10*s*.

1. Not awarded.
2. G. Meyer, Esq.

Class 10.—Grapes, any other Black Grape, 2 bunches. (The name of the variety must be stated.)

First Prize, £2 ; Second, £1 10*s*.

1. Duke of Newcastle.
2. Lord Hastings.

Class 11.—Grapes, 'Muscat of Alexandria,' 2 bunches.

First Prize, Silver Knightian Medal and £2 ; Second, £2 ; Third £1 10*s*.

1. Duke of Newcastle.
2. S. P. Emanuel, Esq., Oatlands Lodge, Weybridge (gr. J. Lock).
3. Lord Hastings.

Class 12.—Grapes, any other White Grape, 2 bunches. (The name of the variety must be stated.)

First Prize, £2 ; Second, £1 10*s*.

1. Lord Somers.
2. Duke of Newcastle.

Class 13.—Collection of Hardy Fruits, in a space not exceeding 12 x 3. Thirty dishes distinct, grown entirely in the open; not more than 12 varieties of Apples or 8 of Pears.

First Prize, Silver Hogg Medal and £2; Second, £2.

1. Mr. R. Staward, The Gardens, Panshanger, Herts.
2. Lord Somers.

Division II.

For Fruit grown entirely out of Doors.

OPEN TO NURSERYMEN ONLY.

Class 14.—30 feet run of 6 feet tabling. Exhibitors were allowed to show in one only of these classes.

Gold Knightian Medal.
Mr. J. C. Allgrove, Middle Green, Langley, Slough.

Gold Medal.
Messrs. Bunyard, Royal Nurseries, Maidstone.

Silver-gilt Knightian Medal.
Messrs. Cannell, The Nurseries, Eynesford, Kent.

Silver Knightian Medal.
Mr. Notcutt, Woodbridge.

Silver Banksian Medal.
Messrs. Seabrook, The Nurseries, Chelmsford.

Class 15.—20 feet run of 6 feet tabling.

Gold Medal.
Messrs. Spooner, The Nurseries, Hounslow.

Silver-gilt Hogg Medal.
Messrs. Cheal, Crawley, Sussex.

Silver-gilt Banksian Medal.
Barnham Nurseries, Barnham Junction, Sussex.

Silver Knightian Medal.
Mr. H. Close, Littlecroft, Orpington.

Silver Banksian Medal.
Mr. E. Parsons, Worcester.

Division III.

OPEN TO MARKET GROWERS ONLY.

Class 16.—Apples, 20 baskets of (cooking and dessert, distinct). Fruit suitable for market purposes will have more consideration than a large number of varieties. The size of the baskets limited to half-bushels if round, to grape (baby) baskets if rectangular.

Silver Cup.
Lt.-Col. Lumley Webb, Ham Green, Upchurch, Sittingbourne.

Division IV.

Fruits grown entirely in the Open Air.

OPEN TO GARDENERS AND AMATEURS ONLY.

Class 17.—Apples, 24 dishes distinct, 16 cooking, 8 dessert. The latter to be placed in the front row.

First Prize, Fruiterers' Company Silver-gilt Medal and £3; Second, £3; Third, £2.

1. C. A. Cain, Esq.
2. Lord Somers.
3. J. Liddell, Esq., Sherfield Manor, Basingstoke (gr. R. Learmouth).

Class 18.—Apples, 12 dishes distinct, 8 cooking, 4 dessert. The latter to be placed in the front row.

First Prize, Fruiterers' Company Silver Medal and £2 ; Second, £1.

1. G. Miller, Esq.
2. Mr. F. G. Gerrish, Pendley Manor Gardens, Tring.

Class 19.—Cooking Apples, 6 dishes distinct.

First Prize, £1 ; Second, 15*s*.

1. C. A. Cain, Esq.
2. Mr. F. G. Gerrish.

Class 20.—Dessert Apples, 6 dishes distinct.

First Prize, £1 ; Second, 15*s*.

1. Mr. F. G. Gerrish.
2. Lord Somers.

Class 21.—Dessert Pears, 18 dishes distinct.

First Prize, Silver-Gilt Knightian Medal and £2 ; Second, £2 ; Third, £1.

1. J. Liddell, Esq.
2. C. A. Cain, Esq.
3. Dr. Jackson, Thornton Heath (gr. W. Paully).

Class 22.—Dessert Pears, 9 dishes distinct.

First Prize, £1 10*s*. ; Second, £1.

1. Lord Somers.
2. Lord Hillingdon.

Class 23.—Plums, 3 dishes distinct.

First Prize, £1 ; Second, 10*s*.

1. C. H. Berners, Esq., Woolvestone Park, Ipswich (gr. W. Messenger).
2. J. Liddell, Esq.

Class 24.—Damsons, or Bullaces, 3 dishes distinct.

First Prize, 10*s*. ; Second, 7*s*. 6*d*.

1. Mr. F. G. Gerrish.

Class 25.—Morello Cherries, 50 fruits.

First Prize, 7*s*. ; Second, 5*s*.

1. Lord Somers.
2. F. R. Rodd, Esq.

Class 26.—Autumn Raspberries, 1 dish of 50 fruits.

First Prize, 7*s*. ; Second, 5*s*.

1. E. E. Palmer, Esq.

DIVISION V.

Special District County Prizes.

OPEN TO GARDENERS AND AMATEURS ONLY ; ALL FRUIT EXHIBITED MUST HAVE BEEN GROWN ENTIRELY IN THE OPEN.

AA. Apples, six dishes distinct, four cooking, two dessert.

First Prize, £1, and 3rd Class single fare from Exhibitor's nearest railway station to London.
Second Prize, 15*s*. and railway fare as above.

BB. Pears, Dessert, six dishes distinct.

First Prize, £1 10*s*. and railway fare as above.
Second Prize, £1 and railway fare as above.

Class 27.—Open only to Kent growers.

AA. { 1. Rev. J. R. Leigh, Vicarage, Yalding, Kent (gr. G. Johnson).
2. Rev. H. A. Bull, Wellington House, Westgate-on-Sea (gr. F. King).

BB. { 1. Bull, Rev. H. A.
2. Leigh, Rev. J. R.

Class 28.—Open only to growers in Surrey, Sussex, Hants.

AA. { 1. W. H. Smith, Esq., West Dean Park, Chichester.
2. Rev. McMurdie, Woburn Park, Weybridge (gr. A. Basile).

BB. { 1. Rev. McMurdie.
2. E. E. Palmer, Esq.

Class 29.—Open only to growers in Wilts, Dorset, Somerset, Devon, and Cornwall.

AA. { 1. Major Wingfield-Digby, Sherborne Castle, Dorset (gr. T. Turton).
2. John Copp, Esq., Ferndale, Teignmouth, S. Devon.

BB. { 1. Major Wingfield-Digby.
2. Lady M. Morrison.

Class 30.—Open only to growers in Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

AA. { 1. Sir Edward Pearson, Brickendonbury, Hertford (gr. W. Stephenson).
No second.

BB. { 1. Sir E. Pearson.
No second.

Class 31.—Open only to growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

AA. { 1. C. H. Berners, Esq.
2. Sir R. Shafto Adair, Bt., Flixton Hall, Bungay.

BB. { 1. Sir R. Shafto Adair, Bt.
2. C. H. Berners, Esq.

Class 32.—Open only to growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

AA. { 1. Mark Firth, Esq., Carlton Park, Market Harboro' (gr. P. W. Thatcher).
No second.

BB. No entries.

Class 33.—Open only to growers in Worcester, Hereford, Monmouth, and Wales.

AA. { 1. W. J. Gresson, Esq., Stoke House, Severn Stoke, near Worcester (gr. T. Parry).
2. Mrs. Smart, Coverpoint, Llansannan, Abergele (gr. R. Rogers).

BB. { 1. W. J. Gresson, Esq.
No second.

Class 34.—Open only to growers in the six northern counties of England, and in the Isle of Man.

AA. { 1. William Orr, Esq., Woodwell, Silverdale, Lancs.
2. James Cocker, Esq., Chesters, Humshaugh, Northumberland.

BB. No entries.

Class 35.—Open only to growers in Scotland.

AA. { 1. Captain Gordon, Threave House, Castle Douglas, Kirkcudbright (J. Duff).
No second.

BB. No entries.

Class 36.—Open only to growers in Ireland.

AA. { 1. Earl of Bessborough, Piltown, Kilkelly (gr. T. E. Tomalin).
2. Earl of Drogheda, Moore Abbey, Monasterevan (gr. C. Pilgrim).

BB. { 1. Hugh Innes, Esq., Stewart Institute, Palmerston, Co. Dublin.
2. Earl of Bessborough.

Class 37.—Open only to growers in the Channel Islands.

No entries.

Choice Dessert Apples.

N.B.—The Judges were instructed to prefer Quality, Colour, and Finish to mere size.

[An Exhibitor may only show one dish in each Class.]

In each class: First Prize, 7*s.*; Second Prize, 5*s.*; but when the entries exceed six in any Class the Judges may at their discretion recommend a Third Prize of 4*s.*

Class 38.—Adams' Pearmain.

1. E. Matthews, Esq.
2. Sir R. Shafto Adair, Bt.
3. Major Wingfield-Digby.

Class 39.—Allington Pippin.

1. A. E. Cumberbatch, Esq., Ware Park, Ware, Herts (gr. F. W. Miles).
2. Lady M. Morrison, Fonthill House, Tisbury, Wilts (gr. H. H. Mills).
3. E. Matthews, Esq.

Class 40.—American Mother.

1. E. Matthews, Esq.
2. E. E. Palmer, Esq.
3. F. C. Stoop, Esq., Westhall, Byfleet, Surrey (gr. G. Carpenter).

Class 41.—Barnack Beauty.

1. E Matthews, Esq.
2. W. H. Smith, Esq.
3. F. C. Stoop, Esq.

Class 42.—Ben's Red.

1. C. H. Berners, Esq.
2. Rev. H. A. Bull.

Class 43.—Blenheim Orange.

1. E. E. Palmer, Esq.
2. C. H. Berners, Esq.
3. Rev. H. A. Bull.

Class 44.—Charles Ross.

1. W. J Gresson, Esq
2. E. Matthews, Esq.
3. G. F. Marsh, Esq., Morningside, Marchmont Road, Wallington.

Class 45.—Claygate Pearmain.

1. F. L. Lansdell, Esq., Westmoors, near Wimborne, Dorset.
2. E. Matthews, Esq.

Class 46.—Coronation.

1. F. L. Lansdell, Esq.
2. E. Matthews, Esq.
3. W. H. Lewis, Esq., Bedgebury Park, Goudhurst.

Class 47.—Cox's Orange.

1. Major Wingfield-Digby.
2. F. L. Lansdell, Esq.
3. G. F. Marsh, Esq.

Class 48.—Egremont Russet.

1. Major Wingfield-Digby.
2. E. Matthews, Esq.

Class 49.—James Grieve.

1. J. Copp, Esq.
2. W. H. Smith, Esq.
3. F. L. Lansdell, Esq.

Class 50.—Lord Hindlip.

1. Lady M. Morrison.
2. E. Matthews, Esq.

Class 51.—Margill.

1. F. C. Stoop, Esq.
2. R. Staward.
3. Major Wingfield Digby.

Class 52.—Ribston Pippin.

1. Marquis of Ripon.
2. C. H. Berners, Esq.
3. W. H. Smith, Esq.

Class 53.—Rival.

1. Lady M. Morrison.
2. C. H. Berners, Esq.
3. Rev. J. R. Leigh.

Class 54.—St. Edmund's Pippin.

1. Major Wingfield-Digby.
2. E. Matthews, Esq.

Class 55.—Wealthy.

1. E. E. Palmer, Esq.
2. C. H. Berners, Esq.
3. Duke of Newcastle.

Class 56.—Eight fruits of any early variety, not named above, fit for use.

Four Prizes, 7*s.*, 6*s.*, 5*s.*, 4*s.*

1. F. C. Stoop, Esq.
2. Marquis of Ripon.
3. F. West, Esq.
4. Lady Morrison.

Class 57.—Eight fruits of any late variety, not named above.

Four Prizes, 7*s.*, 6*s.*, 5*s.*, 4*s.*

1. C. H. Berners, Esq.
2. F. C. Stoop, Esq.
3. Marquis of Ripon.
4. W. H. Smith, Esq.

Choice Cooking Apples.

Class 58.—Beauty of Kent.

1. Rev. McMurdie.
2. Major Wingfield-Digby.
3. Earl of Drogheda.

Class 59.—Bismarck.

1. Sir E. Pearson.
2. Sir M. Turner.
3. A. E. Cumberbatch, Esq.

Class 60.—Blenheim Orange (large fruits).

1. F. West, Esq.
2. Major Wingfield-Digby.
3. J. S. Kelly, Esq.

Class 61.—Bramley's Seedling.

1. E. Matthews, Esq.
2. E. E. Palmer, Esq.
3. Sir E. Pearson.

Class 62.—Cellini.

1. Mrs. Norden.
2. G. F. Marsh, Esq.
3. E. Matthews, Esq.

Class 63.—Dumelow's Seedling; *syns*. Wellington and Normanton Wonder.

1. E. Matthews, Esq.
2. F. C. Stoop.
3. R. P. Emanuel, Esq.

Class 64.—Ecklinville.

1. E. Matthews, Esq.
2. R. Collard, Esq., Kynnersley, Shenfield, Essex.
3. J. W. Hussey, Esq.

Class 65.—Emperor Alexander.

1. Sir R. Shafto Adair, Bt.
2. Sir E. Pearson.
3. W. J. Gresson.

Class 66.—Gascoyne's Scarlet (large fruits).

1. R. Staward.
2. Duke of Newcastle.
3. Sir E. Pearson.

Class 67.—Golden Noble.

1. Sir E. Pearson.
2. Major Wingfield-Digby.

Class 68.—Grenadier.

1. Captain Gordon.

No other prizes.

Class 69.—Hormead Pearmain.

1. E. Matthews, Esq.
2. G. F. Marsh, Esq.

Class 70.—Lane's Prince Albert.

1. A. E. Cumberbatch, Esq.
2. Lady M. Morrison.
3. E. Matthews, Esq.

Class 71.—Lord Derby.

1. Rev. J. R. Leigh.
2. E. Matthews, Esq.
3. R. Staward.

Class 72.—Mère de Ménage.

1. Sir E. Pearson.
2. E. Matthews, Esq.
3. E. E. Palmer, Esq.

Class 73.—Newton Wonder.

1. E. Matthews, Esq.
2. Wm. Hy. Lewis, Esq.
3. Rev. H. A. Bull.

Class 74.—Peasgood's Nonesuch

1. M. Firth, Esq.
2. Rev. J. R. Leigh.
3. F. West, Esq.

Class 75.—Potts' Seedling.

1. Major Wingfield-Digby.
2. R. Staward, Esq.
3. Geo. Churcher, Esq.

Class 76.—Royal Jubilee.

1. W. H. Smith.
2. Major Wingfield-Digby (gr. T. Turton).

Class 77.—Stirling Castle.

1. Marquis of Ripon.
2. E. Matthews, Esq.

Class 78.—The Queen.

1. Sir E. Pearson.
2. E. E. Palmer, Esq.
3. E. Matthews, Esq.

Class 79.—Warner's King.

1. F. West, Esq.
2. Rev. McMurdie.
3. C. H. Combe, Esq.

Class 80.—Eight fruits of any variety not named above.

Four prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. E. E. Palmer, Esq.
2. Lady M. Morrison.
3. Mark Firth, Esq.

Choice Dessert Pears.

First Prize, 7*s*.; Second, 5*s*.; but when the entries exceed six in any Class, the Judges may, at their discretion, recommend a Third Prize of 4*s*.

Class 81.—Beurré d'Amanlis.

1. F. West, Esq.

Class 82.—Beurré d'Anjou.

1. C. H. Combe, Esq.
2. Major Wingfield-Digby.

Class 83.—Beurré Bosc.

1. Sir R. Shafto Adair, Bt.
2. Major Wingfield-Digby.
3. Rev. McMurdie.

Class 84.—Beurré Hardy.

1. Major Wingfield-Digby.
2. Sir R. Shafto Adair.
3. C. H. Berners, Esq.

Class 85.—Beurré Superfin.

1. C. H. Berners, Esq.
2. C. H. Combe, Esq.
3. Major Wingfield-Digby.

Class 86.—Charles Ernest.

1. C. H. Berners, Esq.
2. Rev. McMurdie.
3. E. Matthews, Esq.

Class 87.—Conference.

1. G. F. Marsh, Esq.
2. C. H. Berners, Esq.
3. Rev. McMurdie.

Class 88.—Doyenné du Comice.

1. Hy. Shipley, Esq., The Bungalow, Cobham, Surrey.
2. W. H. Smith, Esq.
3. E. Matthews, Esq.

Class 89.—Durondeau.

1. Rev. McMurdie.
2. G. F. Marsh, Esq.
3. R. Staward, Esq.

Class 90.—Easter Beurré.

1. F. West, Esq.
2. C. H. Berners, Esq.

Class 91.—Emile d'Heyst.

1. C. H. Berners Esq.
2. Duke of Newcastle.

Class 92.—Fondante d'Automne.

1. C. H. Berners, Esq.
2. C. H. Combe, Esq.
3. Hy. Shipley, Esq.

Class 93.—Fondante de Thirriot.

1. Rev. McMurdie.
2. C. H. Berners, Esq.

Class 94.—Glou Morceau.

1. Rev. McMurdie.
2. C. H. Combe, Esq.
3. Lady M. Morrison.

Class 95.—Joséphine de Malines.

1. Sir E. Pearson.
2. A. E. Cumberbatch, Esq.
3. Major Wingfield-Digby.

Class 96.—Louise Bonne of Jersey.

1. G. F. Marsh, Esq.
2. C. H. Berners, Esq.
3. Marquis of Ripon.

Class 97.—Marie Benoist.

1. Major Wingfield-Digby.
2. C. H. Berners, Esq.

Class 98.—Marie Louise.

1. Rev. McMurdie.
2. C. H. Berners, Esq.
3. Major Wingfield-Digby.

Class 99.—Nouvelle Fulvie

1. Major Wingfield-Digby.
2. A. E. Cumberbatch, Esq.

Class 100.—Pitmaston Duchess.

1. C. H. Berners, Esq.
2. Rev. McMurdie.
3. C. H. Combe, Esq.

Class 101.—Souvenir du Congrès.

1. Rev. McMurdie.
2. C. H. Berners, Esq.

Class 102.—Thompson.

No entries.

Class 103.—Triomphe de Vienne.

1. C. H. Berners, Esq.
2. Rev. McMurdie.

Class 104.—Winter Nelis.

1. Major Wingfield-Digby.
2. G. Meyer, Esq., Whistler's Wood, Woldingham (gr. F. Norwood).

Class 105.—Eight fruits of any early variety not named above.
Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. Sir R. Shafto Adair.
2. C. H. Berners, Esq.
3 Rev. McMurdie.
4. F. R. Rodd, Esq.

Class 106.—Eight fruits of any late variety not named above.
Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. C. H. Berners, Esq.
2. Rev McMurdie.
3. Geo. Churcher, Esq.
4. Mrs. Norden.

AFFILIATED SOCIETIES CHALLENGE CUP.

Apples and Pears.

Six Dishes, distinct, Cooking Apples; Six Dishes, distinct, Dessert Apples; Six Dishes, distinct, Dessert Pears, six Fruits to each dish. Each Society competing collects all the specimens shown from amongst their own members only, and not from outside. Eight days' notice must be given of intention to compete.

First, Challenge Cup to be held for twelve months, and Silver Gilt Knightian Medal;
Second, Silver Gilt Banksian Medal.

1. Ipswich and District (J. Mann, Sec., Arboretum Lodge, Ipswich).
No second.

GENERAL MEETING.

October 23, 1917.

Mr. E. A. Bowles, V.M.H., in the Chair.

Fellows elected (37).—Major B. F. S. Baden-Powell, E. G. Band, W. R. Baxter, Miss M. Bliss, C. J. Bowkett, C. Butler-Stoney, Sir Wm. Cain, F. W. Cockeram, Lady Collingwood, P. C. Crockford, W. J. Dewar, W. Easlea, H. C. Edgell, W. Fletcher, S. Flowers, G. Garnett, Miss P. E. Gibson, Miss B. Hall, G. Inman, James Jennison, C. Kirkby-Fenton, H. A. Lamberton, A. C. Lehane, Miss C. Mackenzie, R. W. Macknillon, Lady Mallet, Miss S. Moore, W. Oliver, Miss C. E. Partridge, W. Paul, W. C. Phipps, Mrs. H. A. Pringle, W. A. Shoolbred, D. J. Terry, W. A. Wayland, Capt. A. V. Whitehead, A. Wotherspoon.

Affiliated Societies (7).—Egyptian Horticultural Society, Ellesmere Port Co-operative Society, Exmouth Horticultural Society, Glasbury Food Production Society, Irchester Allotment Association, Netherfield and District Gardeners' Association, The Pitmaston Allotment Holders' Association.

A lecture on "Pergolas" was given by Mr. E. White (see p. 291).

GENERAL MEETING.

November 6, 1917.

Mr. G. Loder, F.L.S., in the Chair.

Fellows elected (16).—P. A. Bayman, H. A. M. Borland, A. Currey, C. D. Dick, G. D. Greenhough, J. B. Hinshaw, J. H. Lowery, R. W. Macmillan, G. Mitchell, Lieut.-Col. R. B. Orlebar, W. B. Paterson, Miss E. A. Stanford, L. Taylor, A. Thompson, C. G. Traill, G. P. Walford.

Fellows resident abroad (2).—Mrs. F. M. Mason, S. L. Pathack.

Associates (2).—W. Dibben, Miss D. Radcliffe.

Affiliated Societies (2).—Galbraith Road Allotment Association, Ynysbwl Horticultural Society.

A lecture on "Useful Books for an Amateur Gardener's Library" was given by Mr. E. A. Bowles, V.M.H. (see p. 359).

GENERAL MEETING.

November 20, 1917.

Lord Grenfell in the Chair.

Fellows elected (18).—H. D. Barton, Dr. F. Bedford, Miss E. Bengough, Rev. T. Bird, W. E. Brockman, Miss H. Dawe, R. S. Farden, Sir W. Hughes-Hunter, A. Jones, M. Lawson, G. H. Mackereth, General Sir A. Paget, A. D. Pilkington, Miss M. K. Southam, Lady A. Stanley, J. R. Stanley, T. G. Toop, J. B. Verel.

Fellows resident abroad (1).—G. L. Hinde.

Associates (1).—Miss L. E. Roberts.

Affiliated Societies (18).—Barry Island Gardeners' Association, Benfieldside and District Amateur Gardeners' Association, Bradford Moor and District Horticultural Association, Cwmaman Horticultural Society, Hampstead Joint War Food Production, Harmondsworth Cottage and Allotment Holders' Association, Hurstmonceux Allotment and Small Gardens Association, Oswaldtwistle Floral and Horticultural Society, Parkhill and District Gardeners' Association, Penkhull and District Gardeners' Association, Rosherville Perry St. and District Allotment Association, St. Osyth Cottage and Allotment Holders' Mutual Improvement Association, St. Paul's Ward Allotment Association, Seaford Ladies' College Allotment Society, Shirebrook Garden Holders' Protection Association, Toll Bar Garden Association, Town Council of Peebles Horticultural Society, Wolseley Club Horticultural Section.

GENERAL MEETING.

December 4, 1917.

Sir Harry Veitch, V.M.H., in the Chair.

Fellows elected (29).—W. Amos, J. M. Berckmans, Mrs. H. Bourke, C. Brinton, W. Brown, Miss E. C. Bumsted, Miss M. E. Charlton, Miss K. L. Cheetham, Miss I. Crofts, J. Dowding, F. N. Ellis, W. H. A. Gaddam, Mrs. F. Holroyd, Miss E. Hooper, Miss E. L. Martin, D. J. Moule, Miss J. Penrose, E. W. Roach, Col. O. P. Serocold, Miss V. S. Slade, Miss E. A. Squire, A. C. Tagg, Mrs. K. G. Tapp, Rev. A. T. Thornley, W. Warburton, H. S. H. Wilding, W. Willis, G. E. Woodman, Mrs. R. E. Younghusband.

Fellows resident abroad (2).—W. C. Davies, T. Padmanabha Pillay.

Affiliated Societies (17).—Acton and District Smallholders' Amateur Gardeners' Association, Acton War Relief Allotment Committee, Atherton and District Horticultural Society, Birmingham City Council Allotment Association, Bury and District Allotment Holders' Association, Crompton District Council Horticultural Society, Eastchurch R.N. Air Station Allotment, Hinckley Sweet Pea and Rose Horticultural Society, Hoylake and West Kirby Allotment Holders' Association, Levenshulme and District Allotment Holders' Society, Mansfield Woodhouse Garden Holders' Association, May Lane Allotments Association, St. Ippolyts and Gosmore Food Production Society, Tamworth-in-Arden Gardeners' Co-operative Society, Tenby Horticultural Society, Trent Embankment Garden Holders' Association, Tutbury Allotments Association.

SCIENTIFIC COMMITTEE.

JULY 3, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and five members present.

Peloric Delphinium.—Mr. W. C. Worsdell, F.L.S., showed spikes of *Delphinium* var. from Dr. Chapman, of Reigate, of which the terminal flower was regularly peloric and spurred, and the peduncle fasciated.

Festuca × loliacea.—Mr. J. Fraser showed specimens of the hybrid grass *Festuca × loliacea,* derived from *Festuca elatior* and *Lolium perenne.* It is a somewhat variable plant, approaching at times the one, at others the other parent, and is not at all infrequent, apparently especially in water-meadows.

Various Plants.—Mr. Bowles showed, on behalf of Mr. Elwes, the late-flowering Xiphium Iris, *I. Taitii,* at its best after all others of this group are past; the Asiatic *Streptopus amplexicaulis, Delphinium Brunonianum,* the dwarf form of *Poterium obtusum* called *hakusanense,* a very dark form of *Campanula amabilis,* and a well-fruited shoot of the so-far unnamed *Lonicera* F. 269, collected by Mr. Farrer in Kansu.

SCIENTIFIC COMMITTEE, JULY 17, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Fasciated Asparagus.—Col. Sandeman, of Hayling Island, sent a very large specimen of the common Asparagus showing fasciation, having a stem over 2 inches in breadth.

Infertility in Barley Field.—Dr. J. A. Voelcker showed specimens of Barley from fields on Salisbury Plain very stunted and poor, and another of about normal growth from places in the fields where stooks had stood last season for a month. Doubtless the greater fertility of the place where the stooks had stood was due to the washing out of salts, &c., from the old Barley, and possibly also to protection from washing of the soil beneath them; but the infertility of the remainder of the field, considering the nature of the manurial treatment, must have been at least partially due to some other cause, and possibly to the gout fly, the chrysalids of which were present in some of the specimens.

Enations of Foliage of Picrasma ailanthoides.—Mr. W. C. Worsdell showed foliage of this interesting Himalayan tree belonging to the Simarubaceae, and hardy at Kew, whence the specimens came, having on the upper side of the rachis both at the nodes and along the internodes numerous enations of various forms, some being shaped like a cup or goblet.

Hybrid Calceolarias.—Mr. E. J. Allard showed hybrids between *Calceolaria alba* and other forms, including *cana, integrifolia,* and a garden hybrid of *cana, alba* being the pollen parent. In every case, foliage, habit and flower colour were of the pollen-parent type, and in every case they were sterile. This is a remarkable case of almost complete paternal inheritance, comparable with the known cases of maternal inheritance, *e.g.,* in Primulas. *C. alba* itself is sterile so far as the ovules go.

Various Plants.—Mr. H. J. Elwes showed a number of plants from his garden, including *Astrantia helleborifolia*; a very floriferous *Lonicera* of bushy, late-flowering habit, perhaps *L. grata*; *Pelargonium Endlicherianum,* and others; *Theropogon pallidus,* somewhat resembling a large-flowered pink Lily-of-the-Valley, but lacking scent, native of the Himalaya; *Hymenocallis*; *Aristolochia ornithocephala,* strongly scented in the daytime, but scentless at night.

Ants and Lilium regale.—Mr. Bowles showed a bud of *Lilium regale* and read the following note: " A group of this growing in a garden at Norwich has been attacked by ants. The owner of the garden has watched the ants at work on the unopened buds, and has seen them carry away particles of green matter that they have apparently extracted from the flower. They confine their attention in the first place to those portions of the flower that are coloured with the chocolate-brown that comes on *regale* in its early stages. The first effect that is apparent is that the chocolate disappears in patches. As the flowers develop the portions attacked begin to decay, and, naturally, spoil the flower.

So far as can be ascertained, no other variety of Lily growing in the neighbourhood has been touched, which would make it appear as though *L. regale* possesses some particular attraction for the pests. It is necessary to find some remedy, as the attacks of the ants are so persistent that a fine group of this beautiful Lily has been ruined within the course of a fortnight." It is probable that a disc of cardboard covered with Tanglefoot fixed round the stem some little distance from the ground would prevent the ants from reaching the flowers.

Change of Colour in a White Currant.—Dr. Walter Dick sent a note calling attention to the complete reversion of a White Currant planted against a wall at Great Massingham, King's Lynn, to a red form. For two years prior to the present the plant bore white Currants, but this season all on the bush are red, and ripe ten days earlier than those on other bushes in the garden.

Spencer-flowered Cupid Sweet Pea.—Mr. G. T. Dickson, Newtownards, sent a Cupid Sweet Pea with waved flowers of the Spencer type, which he had raised along Mendelian lines by crossing (in 1913) a tall Spencer with the ordinary grandiflora type of Cupid Sweet Pea. The new form appeared in the second generation, and has bred true since. Mr. Dickson sent the following note :

The great advantage of the formation of a chart based upon the Mendelian hypothesis by plant breeders before commencing hybridizing is very clearly demonstrated in the following experiments.

In 1912 I considered the possibility of what, to my mind, would be a valuable contribution to floriculture and at the same time provide an experiment of scientific interest.

The experiment, I should further add, was planned on an economic, rather than an academic, basis ; the objective I had in view was to put the modern "Spencer form" of the inflorescence of the tall Sweet Pea upon the Cupid or Dwarf type of Sweet Pea, eliminating from the latter variety the horticultural "out of date" Grandiflora inflorescence.

I worked the problem out in theory thus :—

Assuming one can cross successfully the tall Spencer with the Cupid Grandiflora in 1913, the resultant hybrid in 1914 (F1) generation would be tall, containing the gametes as undernoted.

* Let t = Tall ; S = Spencer ; C = Cupid ; g = Grandiflora.
t and g to be assumed Dominant factors.
S and C to be assumed Recessive factors.
The 1913 cross would be :
Tall Spencer × Cupid Grandiflora ;
or, tS × Cg.
resulting in (tSCg) ; F1 generation (1914).
The 1914 cross would be tSCg × tSCg.

Thus the gametes in the above hybrid would be as the monoclinous flower plan on p. xcvii shows.

This is a design of my own, and one which I think should simply illustrate the sexual unions as they could take place in an hermaphrodite flower.

The foregoing, as I have already stated, was purely theoretical, but the experiment, covering the years 1913, 1914, 1915, 1916, and proved in 1917, has worked out entirely in agreement with the Mendelian hypothesis.

When I commenced my experiment I was doubtful as to whether a sexual affinity existed in the two forms of Lathyrus I had chosen to experiment with, and indeed I may add that I had almost given up hope of effecting a cross between the two, for it was only after 130 operations that I established one single cross. With this all-essential success I assumed that the characters for tallness and grandiflora form would be dominant, and that the characters for dwarfness and Spencer form would be recessive, and that when I found the latter in a combined state amongst my cultures in the F2 generation I had bred the new form, viz. a Cupid Sweet Pea with Spencer flowers, which I had set out to accomplish.

My imaginary chart, which proved a reality, was not based on an unreasonable assumption, for although I was treading, to me, new scientific ground I had no reason to disbelieve that certain factors would be dominant and others recessive, as I had specified.

The experiment suggests (*a*) that the old Grandiflora Cupid is probably a mutation from the tall form, and (*b*) that the Spencer form of inflorescence in the Sweet Pea has always been a latent factor.

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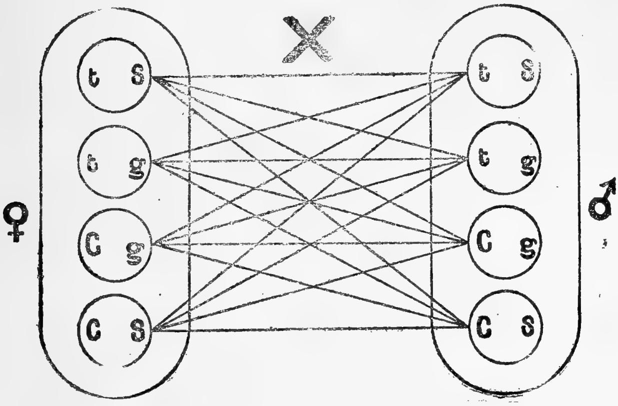
* I use the capital and small letters to enable a homogeneous and heterogeneous combination to be quickly observed.

From a horticultural point of view I think I can say that the new creation which I have sent to the Committee and which I wish to be named 'Professor James Wilson,' provides a substantial foundation for the establishment of a new race of a beautiful dwarf form of the Queen of Hardy Annuals.



Set out in diagram gives the possible combinations,

		♂ t S	♂ t g	♂ C g	♂ C S
♀	t S	t S t S	t g t S	C g t S	C S t S
♀	t g	t S t g	t g t g	C g t g	C S t g
♀	C g	t S C g	t g C g	C g C g	C S C g
♀	C S	t S C S	t g C S	C g C S	C S C S *

F2 generation
1915

* Seed only from (C S / C S) culture to be saved and noted in 1916–17.

Scientific Committee, July 31, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and three members present.

Spencer Cupid Sweet Pea.—A Certificate of Appreciation was unanimously recommended to Mr. George T. Dickson, Newtownards, for his work along Mendelian lines in raising the Spencer type of flower combined with the dwarf habit of the Cupid form of Sweet Pea.

Damage by Hail.—Mr. J. Fraser showed a series of plants, including Onions, Potatos and Peas, in which the damage done by hail storms in June was very evident. The Potato had its stem broken, and both Peas and Onions showed white spots as a result of the battering by the hailstones.

Various Plants.—Mr. H. J. Elwes showed a number of plants from his garden, including *Poterium tenuifolium album*, which there attains to 6 feet in height; *Prunella grandiflora* and *P. Webbiana*; *Dendrobium aurantiacum*, the pseudo-bulbs of which are collected and used in Japanese medicine; *Lycoris squamigera* and *Crinum yemense*, which thrive at Colesborne against a wall; *Crinum Rattrayi*; *Hymenocallis* sp. with an exceedingly sweet scent; *Alstroemeria peregrina alba*; and a species of *Hunnemannia*, a tender plant which when treated as a half-hardy annual does well outdoors.

Nuttallia cerasiformis Fruiting.—Mr. Bowles showed fruits of *Nuttallia* from his garden. Most trees and shrubs of spring-flowering habit appear to be fruiting freely this year.

Curious Sport in Delphinium.—Mr. Berkley, of Redgate Hall, Wolsingham, Co. Durham, sent leaves from a Hybrid Delphinium in his garden, one branch of which, while bearing normal flowers, differed from the others in having entire leaves similar in form to those of *Clematis integrifolia.*

Blackthorn Growing on Apple Bark.—Sir Harry Veitch sent a piece of Apple bark from which a Blackthorn, *Prunus spinosa*, was growing much in the same way as does Misletoe. Mr. Elwes mentioned the case of a Hawthorn which was growing from the branch of a Scots Fir, apparently, as in the Blackthorn shown, rooting into the branch itself.

Sport in Diervilla.—Mr. John Grimes sent from his garden at Cardiff branches of *Diervilla rosea* in which, instead of the normal opposite decussate arrangement of leaves in the upper part of the shoots, the leaves were in whorls of three. This had first occurred in 1915.

Scientific Committee, August 14, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and six members present.

The late Mr. C. T. Druery, V.M.H.—Mr. Bowles referred to the loss the Committee had sustained in the death of Mr. C. T. Druery, who had for many years been a member of the Committee. It was unanimously agreed that a vote of condolence be sent to his relatives, with an expression of the Committee's appreciation of the work Mr. Druery had done in furthering a knowledge of our native Ferns and in the discovery of apospory.

Various Plants.—Mr. H. J. Elwes, F.R.S., exhibited a number of plants from his garden, including *Allium macranthum*, a species which he had collected thirty-six years before in Sikkim; *A. Wallichianum*, an almost stoloniferous species with a singularly compressed and winged stem, also from Sikkim; a woolly species of *Delphinium* from Kashmir; *Zephyranthes candida major*; a species of *Habranthus* from the Argentine with a jointed bulb; *Gladiolus Papilio*, and others.

Potato Black-leg.—Mr. J. W. Odell showed specimens of Potatos affected by the bacterial disease called black-leg, which seems to be rather more prevalent than usual this year. The most marked symptom is the presence of dark patches in the vascular bundles when they are cut across near the base of the stem owing to the vessels being filled with bacteria. Such plants should be lifted at once and their produce should not be used for seed next season.

Ants and Lily Flowers.—Mr. Bowles showed buds of *Lilium sulphureum* from Mr. Fletcher, of Aldwick Manor, Bognor, which had been damaged by ants in the same way as had those which came from Norwich recently. A further communication concerning the latter from Dr. C. A. P. Osburne, from whose garden they came, pointed out that the buds attacked in many cases failed to

open properly, but split across one or more of the petals, while in others the edges of the petals were damaged. It would be of interest to learn whether other species besides *regale* and *sulphureum* are attacked by ants in this manner.

Raspberry Canker.—Some canes of Raspberry attacked by a species of *Coniothyrium* allied to or identical with the one which causes canker in Roses came from Mr. Beresford, of Prestbury, Cheshire. The bark was split and a considerable amount of corrugated growth had developed on the edges of the wounds. This growth was soft in character, and had dried up to some extent in the specimens sent. A similar complaint had occurred some years ago on Chinese Brambles at Wisley, but had not spread, so that cutting out the diseased canes will probably prove an effective check upon the disease.

Scientific Committee, August 28, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and five members present.

The late Mr. Charles Druery.—A letter was received from Mr. T. Murray acknowledging the vote of condolence to the relatives of the late Mr. Charles Druery.

Plumose form of Plantago major.—Mr. Bowles exhibited the plumose form of *Plantago major* similar to that figured in Gerard's Herbal.

Hybrid Campanulas.—Mr. T. B. Grove sent the following notes on the crossing of Campanulas, illustrating them with an interesting series of nature-printed figures of the crosses obtained.

Comparison of F1 Seedlings and the effect of the ♂.

"*Camp. carpatica* 'White Star' ♀ × *Tommassiniana* ♂ produced nineteen seedlings Z1 to Z19, all similar in growth and foliage, viz. intermediate between the two parents, and all had uniform blue flowers, only varying slightly in size and in vigour, but all partook more in branched habit, and foliage of the ♂ than otherwise. I cannot show prints of this series as I only have about half a dozen varieties left of the nineteen.

"During 1915 I crossed:

"Firstly, Z1 ('Norman Grove') ♀ × *Waldsteiniana* ♂ and obtained six seedlings.

"Secondly, Z1 ♀ × *Tommassiniana* ♂ and obtained thirteen seedlings. Note the ♂ the same as in Z1.

"Thirdly, Z1S. 47 ('Wyndley Purple') ♀ × *Waldsteiniana* ♂ and obtained two seedlings.

"The first series of six all showed the effect of the ♂ in the small foliage and erect blooms and habit of flower.

"It will be seen from the prints that all are similar to the ♂ in foliage, with a decided likeness to the same variety in habit of growth, and in every instance have erect flowers like to *Waldsteiniana.*

"The second produced thirteen seedlings of which two have not flowered, but the eleven which have, have all produced blue flowers, eight medium, two darker than type, and one very pale. All are more or less pendant in flower, and most of them show a tendency to the bunched habit of the ♂—in fact, the whole series show a greater similarity in their growth and general appearance to the pollen parent, although in this case it has not been attended with the lanceolate form of foliage of *Tommassiniana.*

"The third cross produced two seedlings, both of which have rich purple-coloured flowers, are both erect in habit of flowering and dwarf in growth like the ♂, and although the foliage is not so small as that variety, the leaves seem to set themselves erect and stiff, more like the ♂ than the ♀. The No. 2 seedling is the more compact, and will make a grand front line variety.

"During 1916 I crossed a large pure white F1 seedling of Z8 × 'White Star' No. 2 (Z8 is brother to 'Norman Grove,' and which has proved to be a 'White Riverslea') with pollen of *Waldsteiniana* on one bloom and with pollen of *Tommassiniana* on another bloom of the same spike of flower, and from these two seed pods I have two series of plants which show the effect of the ♂ in a very marked degree.

"The *Tommassiniana* seedlings again are in the majority, as I have about sixty, of which half have flowered, and all of which show a great similarity to the first seedlings from 'White Star' × *Tommassiniana,* being uniform in colour and pendant in bloom.

"The *Waldsteiniana* seedlings number nine, and all show the ♂ influence in the erect flowers, the erect growth, and the small foliage and dwarf habit from 6 to 8 inches, but which vary a little in range of colour (all blue) from a lovely sky-blue, rather deeper than the ♂.

"I have made prints of all that have flowered except the sixty *Tommassiniana* seedlings which are so uniform in shape and colour, and have also included in the book prints of Z8, W. S. 2, "*Waldsteiniana, Tommassiniana*, 'Norman Grove,' and 'Wyndley Purple' for comparison.

"I regret I cannot send prints of result of Z8 ♀ and 'White Star' ♂, as I have only saved the No. 2 seedling, but originally there were nine seedlings, eight of which were white, like the ♂, and flat saucer-shaped from 1 to 1½ inch across. The other one was a blue colour, and not so saucer-shaped, being a deeper cup, but they all had 'White Star' foliage and habit and ranged from 1 foot to 1½ foot in height.

"These are from written records of the series as I bloomed them, but they show the same influence of the ♂."

The Committee passed a vote of thanks to Mr. Grove.

Pear attacked by Capsid Bugs.—Mr. W. H. North sent a pear from his garden at Southvale Road, Blackheath, attacked by Capsid bugs and showing scabby spots similar to those produced by these pests on Apples.

Fasciated Dahlia.—Mr. Fife sent the stem of a Dahlia in which no branches had been produced in the lower part of the stem, and which showed fasciation above. The buds in the lower part of the stem had apparently not developed, and the phyllotaxis was abnormal.

Scientific Committee, September 11, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and five members present.

Trachycarpus excelsus Fruiting.—Mr. Cory sent from his garden at Duffryn a fruiting shoot of this hardy Palm.

Rust on Black Currant.—Mrs. Shaw sent from Kentchurch Court, Hereford, foliage of Red and Black Currants bearing the teleutospores of the rust fungus *Cronartium ribicola*. This fungus is very prevalent this year and does great damage to young plants of the five-leaved Pines, and especially to *Pinus Strobus*.

Scientific Committee, September 25, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and one member present.

Twin Plum.—Mr. A. McL. May, of Coleraine, Ireland, sent a twin plum in which each part contained a stone. Such twin plums generally arise from the presence of two carpels in the one flower, in place of the normal single one.

A large number of plants attacked by common diseases were sent.

Scientific Committee, October 23, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and seven members present.

Fruit of Trachycarpus excelsus.—Mr. J. Fraser, F.L.S., showed the immature fruits of this Palm from a tree in the open at Holland House, and remarked upon the distribution of male, female, and hermaphrodite flowers, the fruits having developed from the last form of flower. Mr. Bowles said he usually found the last flowers to open were female, as they are in Begonia and *Aegle sepiaria*.

Various Plants.—Mr. Bowles showed the fruit of *Lonicera Hildebrandtii* from a cold greenhouse at Earlham—a very large fruit for a member of this genus, measuring over an inch in diameter; *Rhodostachys argentina*, with stalked heads of flowers; *Akebia lobata* fruit, from Mr Howard Baker's garden near Bristol; fruit of *Actinidia chinensis*, from Mr. P. D. Williams' garden at Lanarth, Cornwall; fruits of the deep-flowered form of *Cydonia Maulei*, to draw attention to their strong and pleasant perfume; fruits of *Arum italicum*, with the foliage, appearing this year unusually early; *Arum hygrophilum*, from the Holy Land; and that of a robust form of *Arum Dracunculus*, all from Myddelton House Gardens, whence also came ripe fruits of the double red Peach, which has from 2 to 4 ovaries, and which bears twin fruits, of the purple-leaved Peach, of the variegated form of *Cornus Mas*, and of the yellow-fruited Yew.

Scientific Committee, November 6, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Twin Vegetable Marrows.—Mr. J. Fraser, F.L.S., showed a Vegetable Marrow with two adnate fruits, and remarked that a considerable number of similar instances had come to his notice during the present year, the twin fruits being sometimes separate.

Many-seeded Apples.—He also showed seeds taken from varieties 'Duchess Favourite,' 'Winter Quarrenden,' and 'King of the Pippins,' showing seeds in excess of the normal number, 10. Such excess number, up to 20, appears to be fairly constant in some varieties, *e.g.*, 'American Mother,' where four ovules in each carpel appear to be normal.

Proliferation in Rhododendron Flowers.—Mr. W. C. Worsdell showed flowers of Rhododendron bearing a second flower, a prolongation of the axis through the ovary. He drew attention to the fact that the axis was normally prolonged through the ovary in this plant.

Variation in Leaves of Morus, &c.—He also commented upon the occurrence of both simple and lobed leaves in plants of the genera *Morus* and *Broussonetia.* He suggested that possibly the lobed leaf was a primitive, the entire a less primitive character in these genera, for strong shoots usually bear lobed leaves. Specimens of *Morus acidosa* shown were almost all lobed, while in many species of *Morus* and *Broussonetia* simple leaves are the rule.

Buds on Roots of Solanum Dulcamara.—Dr. Rendle showed a plant of *Solanum Dulcamara* with a stout root bearing numerous buds all along its length.

Scientific Committee, November 20, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and four members present.

Fruiting of Wistaria.—Mr. Bowles showed fruits of *Wistaria multijuga*, which frequently fruits in his garden, though less profusely this year than in the past season; and of *W. sinensis* now fruiting for the first time in his garden.

Wheat-ear Carnation.—He also showed from Mr. R. Page a specimen of the well-known Wheat-ear Carnation where a multiplication of the bracts takes the place of the flower.

Insect Attack on Leaves of Iris foetidissima.—He also brought from his garden leaves of *Iris foetidissima* with the larvæ and pupæ of a mining *Dipteron* sp.? Several of the larvae feed together in the leaf and pupate in colonies.

Loganberries attacked by Gall on Stem.—Mr. J. Fraser, F.L.S., showed stems of Loganberries attacked by a gall on the stem, similar to those on the stems of Brambles and Raspberries recently shown, and probably due to the attack of the fungus *Coniothyrium* sp.

Scientific Committee, December 4, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Calystegia Sepium rosea.—Mr. J. Fraser, F.L.S., showed specimens of the pink form of *C. Sepium* which he had collected in apparently wild localities in Surrey. Possibly the seed was carried by some means from a garden, for the variety is often seen in gardens.

Convolvulus arvensis hastatus.—He also showed a curious form of the common Bindweed with very narrow leaves which he had found near Molesey, and it was found to agree with the description of the variety *hastatus*.

House Refuse.—Mr. J. Hudson showed a sample of finely powdered house refuse which was being offered as a manure. Since such samples contain large quantities of coal ashes it is unlikely that their value will be great, though if it is to be had for a nominal sum, and at small cost for carting, the material may be worth using. It is bound to be somewhat variable in composition.

Supposed Influence of Light on Fasciation and Flower Production.—Col. H. E. Rawson showed further illustrations of fasciation appearing in plants of *Tropaeolum tuberosum* which were screened in the open garden. Successive

cords had bifurcated till the stems, 22 in number, had become fasciated flat ribbons 10 to 21 mm. wide, closely covered with leaves and without any flowers. In the same position for the two previous years and unscreened the plant showed no signs of fasciation and bore flowers freely. Further examples were shown of increased flowering arising on selectively screened plants, all leaves being suppressed and the flowers appearing in clusters. Spectroscopic examination had shown that red light had been in excess during the increased flowering and blue light during fasciation.

Seedling Pyrus with Adventitious Roots.—Mr. Bowles showed a seedling of *Pyrus Niedzwetzkyana* with adventitious roots in considerable numbers appearing at the nodes as in the old Burr-knot Apple, and as happens in seedling Crabs at times.

Chimonanthus fragrans.—Mr. Bowles also showed flowers of the variety *grandiflorus* of *Chimonanthus fragrans* appearing thus early in the winter.

Stuartia Pseudo-camellia Fruiting.—Rev. W. Wilks sent ripe fruits of *Stuartia Pseudo-camelia* from his garden, where, for the first time, fruits had been produced abundantly.

FRUIT AND VEGETABLE COMMITTEE.

JULY 3, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

No awards were recommended on this occasion.

Exhibits.

Mr. V. Banks, London: bottled fruits and vegetables.
Mr. H. Close, Orpington: Red Currant 'Little Croft Beauty.'
The following report on Marrow 'Rotherside Orange,' exhibited at the previous meeting, was submitted by the Rev. W. Wilks: "I consider it an excellent variety. If when grown out of doors it is as good, it will, I think, take a high place. It is of firmer, more 'meaty,' consistency than any marrow I ever tasted—less watery, in fact, which is the general fault of marrows. Its flavour too is excellent."

FRUIT AND VEGETABLE COMMITTEE, JULY 6, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. W. BATES in the Chair, and three members present.

The Sub-Committee inspected the trials of Broad Beans, Shallots, and of mid-season Peas which received awards last year, and made recommendations for awards to be approved by the full Committee.

FRUIT AND VEGETABLE COMMITTEE, JULY 17, 1917.

Mr. A. H. PEARSON, V.M.H., in the Chair, and fourteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Barr, Taplow, for vegetables.

Silver Banksian Medal.

To the High Commissioner of New Zealand, London, for N.Z. Apples.

Other Exhibits.

Mr. H. Close, Orpington: Currant 'Littlecroft Beauty.'
Mr. V. Banks, London: bottled fruit and vegetables.

The following awards recommended by the Sub-Committee to Broad Beans and a variety of mid-season Pea on trial at Wisley were confirmed by the full Committee.

AWARDS TO BROAD BEANS.

Award of Merit.

No. 5, 'Broad Windsor,' from Messrs. Dobbie.
No. 26, 'Exhibition Longpod,' from Messrs. Dobbie.
No. 43, 'Green Giant,' sent by Messrs. Sutton.

Highly Commended.

No. 22, 'Erdington Gem,' sent by Messrs. Holder & Tilt, Birmingham.
No. 1, 'Giant Windsor,' sent by Messrs. Sutton.
No. 41, 'Green Leviathan,' sent by Messrs. Carter.
No. 10, 'Green Windsor,' sent by Messrs. Sutton.
No. 2, 'Mammoth Windsor,' sent by Messrs. Carter.
No. 25, 'Prizetaker Exhibition Longpod,' sent by Messrs. Bunyard.
No. 33, 'Prolific Longpod,' sent by Messrs. Sutton.

Commended.

No. 39, 'Invicta,' sent by Messrs. Nutting.
No. 8, 'Market Garden Windsor,' sent by Messrs. Carter.

AWARD TO MID-SEASON PEA.

First-class Certificate.

To Pea 'Clipper,' sent by Messrs. Sydenham (**A.M.** 1916).

FRUIT AND VEGETABLE COMMITTEE, JULY 31, 1917.

Mr. OWEN THOMAS, V.M.H., in the Chair, and fifteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Spooner, Hounslow, for Apples.

Cultural Commendation.

To Mr. Anderson, Wellington, New Zealand, for Apple 'Sturmer Pippin.'

Other Exhibits.

Mr. V. Banks, London : bottled fruit and vegetables.
Messrs. Dobbie, Edinburgh : Broad Bean 'Dobbie's Broad Windsor.'

The following awards recommended by the Sub-Committee to Onions (autumn sown), and Beet on trial at Wisley were confirmed.

ONIONS, AUTUMN SOWN.

Award of Merit.

No. 40, 'Autumn Triumph,' sent by Mr. Beckett.
No. 70, 'Froxfield,' sent by Messrs. Barr.
No. 83, 'Mammoth Red Tripoli,' sent by Messrs. Webb.
No. 11, 'White Leviathan,' sent by Messrs. Sutton.
No. 23, 'Yellow Rocca,' sent by Mr. J. Harrison.

Highly Commended.

No. 48, 'Ailsa Craig,' sent by Mr. J. Wilson.
No. 5, 'Covent Garden,' sent by Messrs. Barr.
Nos. 30, 31, 'Cranston's Excelsior,' sent by Messrs. Barr and Wilson.
No. 59, 'Giant Globe Rocca,' sent by Messrs. Barr.
Nos. 20, 21, 22, 'Giant Lemon Rocca,' sent by Messrs. Sutton, Nutting, and Webb.
No. 56, 'Giant Rocca Tripoli,' sent by Messrs. Sydenham.
No. 79, 'Red Italian Tripoli,' sent by Messrs. Nutting.
Nos. 32, 33, 'Trebons,' sent by Messrs. Barr and Nutting.
No. 15, 'White Italian Tripoli,' sent by Messrs. R. Veitch.
No. 8, 'White Spanish Selected,' sent by Messrs. Barr.

Commended.

Nos. 47, 49, 53, 'Ailsa Craig,' sent by Messrs. Harrison, R. Veitch, and Sutton.
No. 82, 'Bassano Tripoli,' sent by Messrs. R. Veitch.
No. 39, 'Giant Zittau,' sent by Messrs. Harrison.
No. 25, 'The Sutton Globe,' sent by Messrs. Sutton.
No. 12, 'White Emperor,' sent by Messrs. Carter.
No. 13, 'White Italian,' sent by Messrs. Harrison.

GLOBE BEET, SPRING SOWN.

Award of Merit.

No. 5, 'Dewing's Turnip-shaped,' sent by Messrs. Barr.
No. 2, 'Globe,' sent by Messrs. Sutton.

Highly Commended.

No. 19, 'Crosby's Egyptian,' sent by Messrs. Barr.
No. 9, 'Selected Globe,' sent by Messrs. Dobbie.

Commended.

No. 11, 'Crimson Globe,' sent by Messrs. Notcutt.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 14, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Award Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Potatos.

Other Exhibits.

Mrs. Bergheim, Hampstead : Peach 'Valparaiso.'
Messrs. Cannell, Eynsford : Tomato 'Lawson's Favourite' and seedling Apples.
Mr. H. Close, Orpington : Plum 'Crofton Glory.'
Mrs. B. Newell, Waterford : Tomatos.
C. Urban, Esq., Teddington : variegated Leek.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 17, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and three members present.

The Sub-Committee inspected the trial of Late Peas and made recommendations for awards for the approval of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 28, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Gold Medal.

To Mr. V. Banks, London, for bottled fruits and vegetables.

Silver Knightian Medal.

To Messrs. Spooner, Hounslow, for Apples.

Award of Merit.

To Plum 'Utility' (votes unanimous), from Messrs. Laxton, Bedford. A first-rate, oval, dessert Plum of medium size with a Gage flavour. It is the result of a cross between 'Jefferson Gage' and 'Peach Plum.'

Cultural Commendation.

To Sir Albert Rollit, Chertsey, for Figs grown out of doors at Chertsey.

The following awards recommended by the Sub-Committee to Late Peas on trial at Wisley were confirmed.

Award of Merit.

No. 24, 'Latest of All,' sent by Messrs. Barr.
Nos. 57, 58, 'Longstander,' sent by Messrs. Sutton and Messrs. Barr.
No. 42, 'Rearguard,' sent by Messrs. Hurst.

Highly Commended.

No. 30, 'Autocrat,' sent by Messrs. Simpson.
No. 23, 'Perpetual Bearer,' sent by Messrs. Barr.
No. 2, 'Reliable,' sent by Messrs. Harrison.
Nos. 12, 14, 'The Gladstone,' sent by Messrs. Simpson and Messrs. Barr.

Commended.

No. 25, 'Anticipation,' sent by Messrs. Carter.
No. 20, 'Late Queen,' sent by Messrs. Nutting.
No. 45, 'Michaelmas,' sent by Messrs. Barr.
No. 55, 'Ne Plus Ultra Selected,' sent by Messrs. Barr.

Other Exhibits.

Messrs. Bunyard, Maidstone: Apple 'Maidstone Favourite.'
Messrs. Chapman, Rye: Marrow 'Rotherside Orange.'
Capt. Stokes, Milford Haven: Onion 'Improved Reading.'

Fruit and Vegetable Committee, September 11, 1917.

Mr. A. H. Pearson, J.P., V.M.H., in the Chair, and eleven members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Mr. J. C. Allgrove, Slough, for fruit-trees in pots.
To C. G. A. Nix, Esq. (gr. Mr. Neal), Crawley, for a collection of fruit.

Silver Knightian Medal.

To Mr. H. Close, Orpington, for a collection of fruit.

Other Exhibits.

Messrs. Bunyard, Maidstone: Grapes.
Messrs. Cannell, Eynsford: Apple 'James Lawson' and Tomato 'Lawson's Favourite.'
F. H. Chapman, Esq., Rye: Marrow 'Rotherside Orange.'

Fruit and Vegetable Committee, September 25, 1917.

Mr. A. H. Pearson, V.M.H., in the Chair, and thirteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Potatos.
To University College, Reading, for vegetables.

Silver-gilt Knightian Medal.

To The Marquis of Ripon (gr. Mr. T. Smith), Kingston Hill, for Apples and Pears.

Silver-gilt Banksian Medal.

To The Alliance Vegetable Co., London, for dried vegetables.

Silver Knightian Medal.

To Messrs. Sutton, Reading, for Marrows, Pumpkins, &c.

Silver Banksian Medal.

To Mr. J. C. Allgrove, Slough, for Plums.
To Mr. H. Close, Orpington, for fruit.
To Messrs. Dickson & Robinson, Manchester, for Onion 'Premier.'

Other Exhibits.

Messrs. Cannell, Eynsford: Apples.
Mr. W. Pope, Newbury: Apple 'Welford Beauty.'
Messrs. Whitelegg, Chislehurst: Apple 'Arthur Theed.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 28, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. OWEN THOMAS, V.M.H., in the Chair, and three members present.

The Sub-Committee inspected the trials of Spring Sown Beet, Spring Sown Onions, and Wart Resistant Potatos at Wisley, and made recommendations for awards for the approval of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 9, 1917.

Mr. A. H. PEARSON, V.M.H., in the Chair, and twenty-four members present.

Award Recommended:—

Award of Merit.

To Plum 'Victor Christian' (votes unanimous), from Mr. Vizard, Churchdown, Gloucestershire.

Fruit large, growing in clusters, oval in shape, black in colour, and covered with a dense bluish bloom, flesh yellowish and full of juice. A valuable late variety for cooking purposes. The tree is a heavy bearer, a vigorous grower, and of sturdy habit.

The following awards recommended to Spring Sown Onions by the Sub-Committee after trial at Wisley were confirmed.

Highly Commended.

No. 35, 'A1,' sent by Messrs. Sutton.
No. 20, 'Ailsa Craig,' sent by Messrs. Dobbie.
No. 12, 'Bedfordshire Champion,' sent by Messrs. Sutton.
No. 32, 'Champion,' sent by Messrs. E. W. King.

Commended.

No. 25, 26, 'Up-to-Date,' sent by Messrs. Nutting, London, Mr. Gray, Sandy, Beds.

Other Exhibits.

Mrs. Backhouse, Sutton St. Nicholas: seedling Apple.
Mrs. Berkeley, of Spetchley, Worcester: *Vitis betulifolia.*
Messrs. Cannell, Eynsford: seedling Apples.
Mr. G. Carpenter, Byfleet: seedling Apples.
Mr. H. Close, Orpington: seedling Plum.
Messrs. Daniels, Norwich: Apple 'Norvic.'
Sir C. S. Henry, Bt., Henley-on-Thames: seedling Apple.
J. Leivers, Esq., Middlebrook: seedling Apple.
Mr. W. Peters, Leatherhead: Apples 'William Peters' and 'Harry Pring.'
C. H. E. Stacey, Esq., Chesham: seedling Apples.
Mr. J. Stevens, Kensal Rise: seedling Pear.
Messrs. Tucker, Faringdon: Apple 'Tucker's Seedling.'
Messrs. R. Veitch, Exeter: fruiting shrubs.
Messrs. J. Waterer, Sons, & Crisp, Twyford: seedling Apple.
Messrs. Whitelegg, Chislehurst: seedling Apples.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 12, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. W. POUPART in the Chair, and two members present.

The Sub-Committee inspected the trial of Wart Resistant Potatos (including cooked samples of each variety) at Wisley and made recommendation for awards for the consideration of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 23, 1917.

Mr. W. POUPART, in the Chair, and eleven members present.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, Taplow, for vegetables.
To Messrs. Bunyard, Maidstone, for fruit.

Silver-gilt Hogg Medal.

To C. A. Cain, Esq., J.P. (gr. Mr. T. Pateman), Welwyn, for fruit.

Silver-gilt Knightian Medal.

To E. E. Palmer, Esq. (gr. Mr. H. E. Wallis), Sherfield-on-Loddon, for vegetables.

Silver Knightian Medal.

To Lady Elizabeth Dawson, Maidenhead, for bottled fruits and vegetables.
To Messrs. Sutton, Reading, for autumn sown vegetables.
To the Council School (headmaster, Mr. A. Stapleton), Purfleet, for fruit and vegetables.

First-class Certificate.

To Apple 'Ellison's Orange' (votes unanimous), from Mr. H. Markham, Barnet. This variety, which received an Award of Merit in 1911, is said to be a cross between 'Cox's Orange Pippin' and 'Calville Blanche.' It is of medium size, yellowish in colour, of excellent flavour, and ripens in October. It is reported to be a good cropper.

Award of Merit.

To Apple 'William Peters' (votes unanimous), from Mr. W. Peters, Leatherhead. Fruit medium size, even and regular in outline; eye open, set in a deep, even-shaped basin; stalk 1 inch long, thin, set in an even, medium-sized cavity; skin, when ripe, greenish-yellow, with broken stripes of bright red where exposed to the sun, a few specks of russet; flesh greenish-yellow, very tender, juicy, sweet, melting, with a delicate flavour. This variety is a first-rate dessert apple, ripe in October, and was raised by Mr. W. Peters, of Givons Gardens, Leatherhead (fig. 60).

The following awards to Beet (spring-sown) and Wart Resistant Potatos recommended by the Sub-Committee after trial at Wisley were confirmed.

BEET, SPRING SOWN.

First-class Certificate.

No. 41, 'Green Top,' Sutton's strain, sent by Messrs. Sutton.

Award of Merit.

No. 57, 'Brydon's Exhibition,' sent by Messrs. Barr.
No. 45, 'Cheltenham Green Top,' sent by Messrs. Sydenham.
Nos. 36, 37, 'Dewar's Northumberland Red,' sent by Messrs. Barr & Nutting.
No. 38, which was sent in as 'Covent Garden Compact Top' by Messrs. Barr, but was considered identical with Nos. 36 and 37.
No. 49, 'Sutton's Perfection,' sent by Messrs. Sutton.
No. 53, 'Selected Red,' sent by Messrs. Nutting.

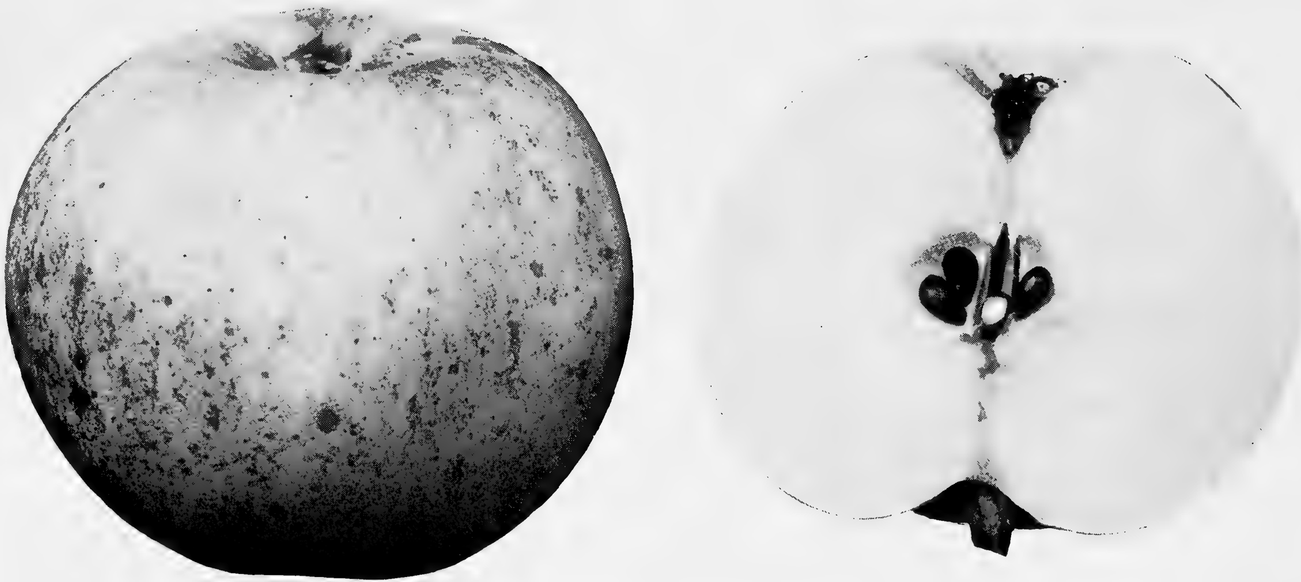


FIG. 60.—APPLE WILLIAM PETERS.'
(p. cviii.)

[To face p. cviii.

Highly Commended.

Nos. 67, 68, 69, 'Deep Blood Red Non-bleeding,' sent by Messrs. McLennan, Veitch, Bell: raised and introduced by Messrs. Bell.
No. 65, 'Sutton's Black,' sent by Messrs. Sutton.
No. 66, 'Dobbie's Purple,' sent by Messrs. Dobbie.
The Committee consider 65 and 66 to be identical.
No. 48, 'Market Favourite,' sent by Messrs. Sutton.
No. 29, 'Veitch's Intermediate,' sent by Messrs. Sutton.
No. 73, 'Yates' Nonpareil Red,' sent by Messrs. Barr, raised by Mr. Yates.

Commended.

No. 31, 'Carter's Perfection,' sent by Messrs. Carter.
No. 52, 'Pragnell's Exhibition,' sent by Messrs. Barr.
No. 23, 'Queen of the Blacks,' sent by Messrs. Barr.

Potatos.

Awards to Potatos resistant to wart disease grown at Wisley to compare cropping and cooking qualities.

The names in brackets following the name of the variety are of those who presented the seed or from whom it was purchased. The seed was in each case grown in Scotland or Ireland.

Award of Merit.

Nos. 30, 31, 'Golden Wonder' (Dobbie, Sutton).
Nos. 6, 7, 8, 'Great Scot' (Dobbie, Sutton, Veitch), with which the Committee considered No. 9, 'Sir Douglas Haig' (Sands), and No. 10, 'Southampton Wonder' (Toogood), to be identical.
No. 20, 'King Albert' (Sands).
No. 5, 'King George' (Sutton).
Nos. 27, 28, 'Langworthy' (Dobbie, Sutton), with which the Committee considered No. 29, 'What's Wanted' (Sutton), to be identical.

Highly Commended.

No. 26, 'Burnhouse Beauty' (Dobbie).
No. 4, 'Conquest' (Sutton).
No. 45, 'Dominion' (Dobbie).
Nos. 13, 14, 'Favourite' (Dobbie, Sutton).
Nos. 32, 33, 'Rob Roy' (McAlister, Veitch).
No. 44, 'St. Malo Kidney' (Fidler).
No. 22, 'The Crofter' (Dobbie).
No. 24, 'Twentieth Century' (Sutton).
Nos. 42, 43, 'White City' (Dobbie, Sutton).
No. 49, 'Western Hero' (Veitch). This variety has not yet been grown in the trials carried out under the Board of Agriculture for wart-resistance.

Other Exhibits.

Mr. A. R. Allan, Uxbridge: seedling Grapes.
Mr. A. Bayley, Slough: Apples.
Mr. T. Coomber, V.M.H., Monmouth: seedling Apple.
Messrs. Godden, Hythe: Apple 'Autumn Peach.'
Mr. W. Humphreys, Huntingdon: seedling Apple.
Messrs. Laxton, Bedford: seedling Apples.
Mr. W. Mason, Royston: seedling Apple.
Mr. W. R. North-Row, London: Quinces.
R.H.S. Gardens, Wisley: Beets and Wart Resistant Potatos.
Dr. Rosenheim, Hendon: Grapes.
Mr. W. H. Sale, J.P., Atherstone; seedling Apple.
Mr. R. G. Searle, Chipping Ongar: Apples.
Mr. J. C. Sheddick, Dereham: Apple 'Paragon.'
The Alliance Vegetable Co., London: Potato 'Ever-Ready.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 6, 1917.

Mr. W. POUPART in the Chair, and twelve members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Cannell, Eynsford, for a collection of fruit.

Silver Knightian Medal.

To The Alliance Vegetable Company, London, for Potato 'Ever Ready.'

Silver Banksian Medal.

To O. Rosenheim, Esq., Golders Green, for 'Black Hamburgh' Grapes grown out of doors.

Cultural Commendation.

To O. Rosenheim, Esq., Golders Green, for 'Black Hamburgh' Grapes grown out of doors.

Other Exhibits.

Mr. A. Bayley, Slough: Apple 'Orange Pippin.'
Messrs. Chapman, Rye: Apples.
Messrs. Cooling, Bath: seedling Apple.
Mr. W. H. Divers, V.M.H., Hook: Apple 'Col. Yate.'
Mr. W. Pope, Newbury: Apple 'Welford Beauty.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 20, 1917.

Mr. W. POUPART in the Chair, and eleven members present.

No awards were recommended on this occasion.

Exhibits.

Mr. C. Elliott, Stevenage: seedling Apple.
Mr. W. H. Newton, Potters Bar: Lettuce 'Winter Beauty.'
Mr. S. Shorter, Seven Kings: Pear 'Shorter's Prolific.'
Mr. J. Vernon, Northwich: Apples.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 4, 1917.

Mr. W. POUPART in the Chair, and twelve members present.

Awards Recommended :—

Silver Knightian Medal.

To Col. W. N. Davis (gr. Mr. Bullock), Slough, for Apples and Pears.

Silver Banksian Medal.

To Sir Daniel Gooch (gr. Mr. Heath), Chelmsford, for Apples.
To Mrs. Miller, Marlow, for confections.

Other Exhibits.

Mr. V. Banks, London: the Home Canner.
Messrs. H. Chapman, Rye: Apple 'Saltcote Pippin.'
Mr. T. Coomber, V.M.H., Monmouth: Apple 'Thomas Coomber.'
Mr. J. Keates, Gt. Marlow: seedling Apple.
Mr. J. Leeder, Postwick: Apple 'Leeder's Perfection' and Apple 'Postwick Rose.'

FLORAL COMMITTEE.

JULY 3, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Baker, Wolverhampton, for hardy plants.
To Messrs. Blackmore & Langdon, Bath, for Delphiniums and Begonias.
To Mr. W. H. Holloway, Shrewsbury, for Sweet Peas.
To Messrs. Piper, Langley, for Sweet Peas and alpine plants.
To Messrs. Wallace, Colchester, for hardy plants.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cuthbert, Southgate, for Gloxinias.
To Messrs. May, Upper Edmonton, for miscellaneous plants.
To Mr. L. R. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. W. Paul, Waltham Cross, for Roses.

Bronze Flora Medal.

To the Alder River Nursery, Iver Heath, for Lilies.
To Mr. J. C. Allgrove, Slough, for hardy plants and shrubs.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Bunyard, Maidstone, for Delphiniums.
To Messrs. Cheal, Crawley, for hardy plants and shrubs.
To Mr. J. Stevenson, Wimborne, for Sweet Peas.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Roses and herbaceous plants.
To Mr. J. Douglas, Great Bookham, for Border Carnations.
To Rev. J. H. Pemberton, Romford, for Roses.

Award of Merit.

To Rose 'Mermaid' (votes unanimous), from Messrs. W. Paul, Waltham Cross. A very beautiful Single Rose having foliage of the *Wichuraiana* type. The flowers, which measure about 4½ inches across, are pale yellow in colour, becoming deeper towards the central mass of golden-orange stamens. The specimens exhibited seemed to indicate that it is a very vigorous variety.

To Rose 'Miss May Marriott' (votes unanimous), from Mr. T. Robinson, Nottingham. A very beautiful sport from the well-known 'Madame Edouard Herriot,' with which it is identical in growth. The flowers are of good form and of a golden apricot colour, shaded with orange on the outer petals. It is exquisite in bud.

To Rose 'Walter C. Clark' (votes 11 for, 2 against), from Messrs. W. Paul, Waltham Cross. A very fragrant deep crimson-maroon Hybrid Tea of very vigorous growth and handsome dark-green foliage. The young shoots are beautifully tinted with red.

Cultural Commendation.

To the Alder River Nursery, Iver Heath, for *Lilium Willmottiae* (Wilson), syn. *L. warleyense.*

Other Exhibits.

Mr. H. Close, Orpington : Delphinium 'Crofton Belle.'
Mr. H. Elliott, Hurstpierpoint : *Richardia Elliottiopica.*
Mr. F. A. Jones, Trowbridge : Perpetual-flowering Carnations.
Mr. H. H. Lee, Exeter : Sweet Pea 'H. H. Lee.'
Mr. A. Perry, Enfield : hardy plants.
Mr. G. Reuthe, Keston : hardy plants.
Messrs. Stark, Great Ryburgh : Poppies.

FLORAL COMMITTEE, JULY 5, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and four members present.

The Sub-Committee inspected the trials of Delphiniums, Annual Poppies, and Eschscholzias, and made recommendations for awards to be approved by the full Committee (pp. cxiii, cxiv).

FLORAL COMMITTEE, JULY 17, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and twenty-seven members present.

Awards Recommended :—

Gold Medal.

To W. H. Holloway, Esq., Shrewsbury, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. Piper, Langley, for Sweet Peas and water plants.

Silver Flora Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums and Begonias.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. F. Cant, Colchester, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. May, Upper Edmonton, for ferns.
To Mr. L. R. Russell, Richmond, for shrubs.

Silver Banksian Medal.

To the Alder River Nursery, Iver Heath, for Lilies.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Brown, Peterborough, for Roses.
To Messrs. Harkness, Hitchin, for Roses.
To Messrs. W. Paul, Waltham Cross, for Roses.

Bronze Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs &c.
To Rev. J. H. Pemberton, Romford, for Roses.

Award of Merit.

To H.T. Rose 'Irish Afterglow' (votes 10 for, 2 against), from Messrs. Alex. Dickson, Newtownards. A beautiful sport from the well-known 'Irish Fireflame.' The flowers, which are single, measure from 3 to 4 inches across and are golden-orange in colour when first open, but assume a pink shade with age. They possess the true Tea scent.

To Rose 'Sunstar' (votes 13 for, 1 against), from Messrs. Alex. Dickson, Newtownards. An H.T. variety of good form and pleasing fragrance. Its colour is carmine-red shaded with gold at the base of the petals.

To *Sambucus racemosa plumosa tenuifolia* (votes, unanimous), from Messrs. G. Paul, Cheshunt. A very graceful shrub having the leaflets divided into long narrow segments, giving the foliage an almost fern-like appearance. The very attractive coral-red berries are borne in large clusters.

Other Exhibits.

Mr. G. R. Downer, Chichester: Gaillardia 'Downer's Double,' and Delphinium 'G. R. Downer.'

Mr. C. Elliott, Stevenage: Delphinium 'Blue Rocket.'

Misses Hopkins, Shepperton: hardy plants.

Mr. F. A. Jones, Trowbridge: Carnation 'Claremont.'

Mr. H. H. Lee, Exeter: Sweet Pea 'H. H. Lee.'

S. Morris, Esq., Norwich: Lonicera F 269.

The following awards recommended by the Sub-Committee to Delphiniums, Eschscholzias, and Annual Poppies on trial at Wisley were confirmed by the full Committee.

Delphiniums.

Award of Merit.

No. 90, 'Col. Sir Wyndham Murray,' sent by Messrs. Blackmore & Langdon.

Nos. 188, 189, 'Capri,' sent by Messrs. Barr and Ruys.

Nos. 183, 184, 'Harry Smetham,' sent by Messrs. Ruys and Blackmore & Langdon.

Nos. 227, 228, 229, 'Moerheimii,' sent by Messrs. Barr, Ruys, and Forbes.

No. 103, 'Rozenlust,' sent by Mr. Ruys.

No. 186, 'Kingston Queen,' sent by Messrs. Smith.

No. 190, 'Lady Georgina Legge,' sent by Messrs. Kelway.

No. 89, 'Lady Hammick,' sent by Messrs. Blackmore & Langdon.

No. 120, 'Mrs. A. J. Watson,' sent by Messrs. Blackmore & Langdon.

No. 127, 'Mrs. Shirley,' sent by Messrs. Blackmore & Langdon.

No. 88, 'Professor Coleman,' sent by Messrs. Baker.

Highly Commended.

Nos. 100, 101, 'Aeroplane,' sent by Messrs. Barr and Ruys.

No. 35, 'Attraction,' sent by Messrs. Forbes.

No. 92, 'Dawn,' sent by Messrs. Kelway.

No. 166, 'Dr. Lodwidge,' sent by Messrs. Kelway.

No. 9, 'Edwin Beckett,' sent by Messrs. Baker.

No. 62, 'Florence,' sent by Messrs. Forbes.

No. 67, 'Galicia,' sent by Messrs. Baker.

No. 55, 'His Excellency,' sent by Messrs. Barr.

No. 125, 'Amos Perry,' sent by Mr. Ruys.

No. 192, *Belladonna grandiflora*, sent by Mr. Ruys.

No. 106, 'Corry,' sent by Mr. Ruys.

No. 145, 'Lady Ravensworth,' sent by Mr. Ruys.

No. 223, 'Progression,' sent by Mr. Ruys.

No. 98, 'Lord Curzon,' sent by Messrs. Blackmore & Langdon.

No. 165, 'Lovely,' sent by Messrs. Kelway.

No. 222, 'Luna,' sent by Messrs. Baker.

Nos. 19, 50, 'Macbeth,' sent by Messrs. Hill and Bunyard.

No. 80, 'Ma Mie,' sent by Messrs. Barr.

No. 187, 'Mrs. James Kelway,' sent by Wisley.

No. 60, 'Mrs. T. G. Baker,' sent by Messrs. Baker.

Nos. 74, 75, 'Novelty,' sent by Messrs. Blackmore & Langdon and Ruys.

No. 32, 'Rev. E. Lascelles,' sent by Messrs. Baker.

Nos. 41, 42, 'Robert Cox,' sent by Messrs. Barr and Blackmore & Langdon.

No. 115, 'Star of Devon,' sent by Messrs. Godfrey.

Commended.

Nos. 215, 216, 'Lize,' sent by Messrs. Ruys and Barr.

No. 81, 'Miss Britton,' sent by Messrs. Barr.

No. 202, 'Queen Mary,' sent by Messrs. Bunyard.

No. 47, 'Rt. Hon. A. E. Fellowes,' sent by Messrs. Kelway.

Eschscholzias.

Highly Commended.

Nos. 24, 25, 26, 'Chrome Queen,' sent by Messrs. R. Veitch, Barr, and Watkins & Simpson.

Nos. 17, 18, *crocea compacta* 'Mandarin,' sent by Messrs. Sydenham and Barr.

No. 8, 'Golden West,' sent by Messrs. Barr.

Annual Poppies.

Award of Merit.

No. 21, 'Dwarf Scarlet Fringed,' sent by Messrs. R. Veitch.

No. 20, 'Scarlet King,' sent by Messrs. Barr.

Highly Commended.

No. 24, 'Cardinal Blush,' sent by Messrs. Dobbie.

No. 25, 'Cardinal Scarlet,' sent by Messrs. Dobbie.

No. 5, 'Dainty Lady,' sent by Messrs. Barr.

No. 7, 'Danebrog,' sent by Messrs. Barr.

No. 52, 'Peacock Poppy' (*P. pavoninum*), sent by Messrs. Barr.

No. 13, Strain of 'Dwarf Double' Pæony-flowered mixed, sent by Messrs. Barr.

Nos. 37 and 38, Strain of 'New Double Queen,' sent by Messrs. Barr and Messrs. R. Veitch.

Nos. 50 and 51, *umbrosum*, sent by Messrs. Dobbie and Barr.

No. 4, 'The Admiral,' sent by Messrs. Barr.

No. 14, 'White Colossal,' sent by Messrs. Barr.

No. 15, 'White Swan' (syn. 'Snowdrift'), sent by Messrs. Barr.

Commended.

No. 43, 'Picotee,' sent by Messrs. Barr.

Floral Committee, July 20, 1917.

Sub-Committee at Wisley.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and three members present.

The Sub-Committee inspected the trials of Delphiniums, Eschscholzias, and Stocks, and made recommendations for awards for the approval of the full Committee (p. cxv).

Floral Committee, July 31, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.

To Messrs. Jones, Lewisham, for Phloxes.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. May, Upper Edmonton, for ferns.

To Mr. G. Reuthe, Keston, for hardy plants.

To Mr. L. R. Russell, Richmond, for foliage of trees and shrubs.

To Messrs. Vert, Saffron Walden, for Hollyhocks.

Bronze Flora Medal.

To Mr. J. C. Allgrove, Slough, for *Thalictrum dipterocarpum* &c.

Bronze Banksian Medal.

To Messrs. Piper, Langley, for hardy plants.

First-class Certificate.

To *Thalictrum dipterocarpum* (votes 12 for, 4 against), from Mr. J. C. Allgrove, Slough. This beautiful herbaceous plant received an Award of Merit on August 18, 1908. The height of the plant is from 4 to 5 feet, and the attractive rose-purple flowers with conspicuous citron-yellow anthers are borne in graceful loose panicles.

Award of Merit.

To *Anemone vitifolia tomentosa* (votes unanimous), from Mr. J. C. Allgrove, Slough. A very striking herbaceous plant having large leaves dark green above and covered with a fine white tomentum on the under side. The flowers are pink shaded with rose outside, and are borne in great abundance on many-branched stems. The height of the plant is 3–4 feet, and it was collected in China by Purdom in 1909.

To *Gentiana Purdomii* (votes 15 for, 1 against), from Mr. J. C. Allgrove, Slough. A very fine Gentian of prostrate habit introduced from China. The flowers are long, deep blue in colour, with small white spots on the lobes of the perianth, white throated and borne in great profusion along the trailing growths. The leaves are long and narrow.

To Gladiolus 'Sunspot' (votes 11 for, 3 against), from Messrs. Kelway, Langport. A very fine variety. The colour is pale salmon-pink over a cream ground and the three lower petals are blotched with scarlet.

Other Exhibits.

Mr. H. Close, Orpington: hardy plants.
Messrs. Dobbie, Edinburgh: Antirrhinum 'Fusilier' and Clarkia 'The Bride.
Mr. G. R. Downer, Chichester: Echinaceas 'Cicely' and 'Gladys.'

The following awards recommended by the Sub-Committee to Delphiniums, Eschscholzias, and Stocks on trial at Wisley were confirmed.

Delphiniums.

Award of Merit.

No. 192, *Belladonna grandiflorum*, sent by Mr. Ruys.
Nos. 12, 13, 'Lamartine,' sent by Messrs. Barr and Ruys.

Highly Commended.

No. 68, 'Conspicua,' sent by Messrs. Blackmore & Langdon.
Nos. 5, 7, 'Daniel Osiris,' sent by Messrs. Blackmore & Langdon and Ruys.
No. 29, 'Hamlet,' sent by Messrs. Bunyard.
No. 77, 'Lord Lansdowne,' sent by Messrs. Blackmore & Langdon.
No. 52, 'Nobilis,' sent by Messrs. Baker.
No. 185, 'Perfection,' sent by Messrs. Blackmore & Langdon.
No. 131, 'Sergeant Béranger,' sent by Messrs. Blackmore & Langdon.
No. 135, 'Statuaire Rude,' sent by Messrs. Blackmore & Langdon.

Eschscholzias.

Award of Merit.

Nos. 17, 18, *crocea compacta* 'Mandarin,' sent by Messrs. Sydenham and Barr.
Nos. 19, 23, 'Mikado,' sent by Messrs. Carter and Barr.

Highly Commended.

No. 11, 'Orange King,' sent by Messrs. Watkins & Simpson.

Stocks (outdoor).

Award of Merit.

Nos. 39, 40, 74, 'Old Rose,' sent by Messrs. Barr, R. Veitch, and Barr.
Nos. 54, 55, 56, 'Queen Alexandra,' sent by Messrs. Simpson, R. Veitch, and Barr.

Highly Commended.

No. 24, 'Almond Blossom,' sent by Messrs. R. Veitch.
No. 10, 'Bianca,' sent by Messrs. Barr.
Nos. 77, 78, 'Canary Yellow,' sent by Messrs. Barr.
No. 47, 'Mammoth Crimson,' sent by Messrs. R. Veitch.
Nos. 18, 19, 'Princess Alice,' sent by Messrs. Barr and Simpson.
Nos. 20, 21, 'Princess Alice Improved,' sent by Messrs. Barr, and Watkins & Simpson.
No. 65, 'Rich Purple,' sent by Messrs. Barr.
Nos. 27, 29, 30, 31, 32, 34, 'Souvenir de Nice,' sent by Messrs. Barr, Simpson, R Veitch, and Barr.

FLORAL COMMITTEE, AUGUST 14, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Mr. J. Box, Haywards Heath, for hardy plants.
To Messrs. May, Upper Edmonton, for ferns.

Silver Banksian Medal.

To the Alder River Nursery, Iver Heath, for Lilies.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cheal, Crawley, for shrubs and Dahlias.
To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To Gladiolus 'Lady Rosemary Portal' (votes unanimous), from Messrs. Kelway, Langport. A good creamy white variety streaked with crimson at the base of the flowers, which are borne in a bold spike.

Cultural Commendation.

To W. B. Cranfield, Esq., Enfield Chase, for *Athyrium Filix-foemina clarissimum*. The fine plant exhibited was a division of the original plant upon which the late Mr. C. T. Druery, V.M.H., discovered the phenomenon of apospory. It was found by R. Moule in North Devon in 1868 and passed into the possession of the late Col. Jones. The fern is the rarest and one of the most beautiful of our native Athyrium family.

Other Exhibits.

S. Morris, Esq., Norwich: Montbretias 'Tangerine,' 'Queen Mary,' and 'Queen Adelaide.'
Mr. W. Wells, Merstham: Phlox 'Thor.'

Mr. W. B. Cranfield and others spoke of the great loss sustained by the Committee by the death of Mr. C. T. Druery, V.M.H., the great fern-lover.

FLORAL COMMITTEE, AUGUST 28, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver Flora Medal.

To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. May, Upper Edmonton, for ferns.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for Dahlias.
To Mr. C. J. Ellis, Weston-super-Mare, for Eustomas.

Bronze Flora Medal.

To Mr. H. Close, Orpington, for hardy plants.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. C. Turner, Slough, for hardy plants.

Award of Merit.

To Dahlia 'Bianca' (votes unanimous), from Mr. C. Turner, Slough. A large pure white Decorative variety of excellent form.

To Dahlia 'Eastern Star' (votes unanimous), from Messrs. Cheal, Crawley. A purplish rose Star Dahlia with maroon shading at the base of the florets. The flowers are borne on good stiff stems.

To Dahlia 'Golden Rain' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A good clear canary-yellow Cactus variety.

To Dahlia 'Harry Crabtree' (votes 6 for), from Messrs. Stredwick, St. Leonards-on-Sea. A purplish-mauve Cactus variety.

To Dahlia 'Medallion' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A yellow Collerette variety with a light collar.

To Dahlia 'Mrs. Herbert Blackman' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A pale rose-pink Garden Cactus variety with a lighter centre.

To Dahlia 'Mrs. J. A. Jarrett' (votes 5 for, 1 against), from Mr. J. A. Jarrett, Anerley. A very showy fiery orange-red Pæony-flowered Dahlia. The florets are very broad and twisted.

To Dahlia 'Primrose Star' (votes unanimous), from Messrs. Cheal, Crawley. A primrose-yellow Star variety similar in form to 'Eastern Star.'

To *Eustoma Russellianum Ellisii* (votes unanimous), from Mr. C. J. Ellis, Weston-super-Mare. A beautiful pale-pink variety of *Eustoma Russellianum*, a little-known greenhouse plant introduced from Texas in 1835. The plants are about 2 ft. high and have ovate, acuminate, glaucous leaves. The flowers, which are borne in a terminal panicle, are very handsome and have a dark blotch at the base of each of the five pink, obovate segments of the corolla. The plant is said to remain in flower for a period of three months.

Other Exhibit.

Messrs. Bunyard, Maidstone : *Calluna vulgaris fl. pl.*

Floral Committee, September 11, 1917.

Mr. H. B. May, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Silver Flora Medal.

To Mr. J. B. Riding, Chingford, for Dahlias.
To Messrs. Piper, Langley, for berried shrubs.

Silver Banksian Medal.

To the Alder River Nursery, Iver Heath, for Lilies.
To Messrs. Cheal, Crawley, for fruiting trees and shrubs.
To Messrs. May, Upper Edmonton, for ferns.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. C. Turner, Slough, for Dahlias.

Award of Merit.

To Crab Apple 'Cheal's Crimson' (votes 16 for), from Messrs. Cheal, Crawley. This very distinct and ornamental Crab is a variety of *Pyrus prunifolia*, and its dark red fruits are much rounder and redder than those of the well-known Crab 'John Downie.'

To Dahlia 'Alma' (votes unanimous), from Messrs. Burrell, Cambridge. A large white Pæony-flowered variety with broad florets.

To Dahlia 'Dominion' (votes 5 for, 1 against), from Messrs. Stredwick, St. Leonards-on-Sea. A good orange-buff Cactus variety tinged with red.

To Dahlia 'Harold' (votes unanimous), from Mr. J. T. West, Brentwood. A very effective Decorative variety. The flowers are large and of a beautiful fiery-red shade.

To Dahlia 'Mauve Star' (votes unanimous), from Messrs. Cheal, Crawley. A very dainty pale-mauve Star Dahlia.

To Dahlia 'Miss Lewis' (votes unanimous), from Mr. J. T. West, Brentwood. A pretty bright-pink Pompon Cactus variety with strong stiff stems.

To Dahlia 'Penelope' (votes 7 for), from Messrs. Burrell, Cambridge. A very effective and distinct Single Decorative variety having cerise-pink flowers striped with white borne on good stems.

To Dahlia 'Rev. John Hamlet' (votes unanimous), from R. Cory, Esq., Cardiff. A Pæony-flowered variety having flowers of good size and of a very striking and beautiful shade of bright pink. The base of the floret is golden yellow.

To Dahlia 'Seahorse' (votes 4 for, 2 against), from Mr. J. T. West, Brentwood. A good form of Decorative Dahlia having deep-yellow flowers tipped with white.

To Dahlia 'St. Egwyn' (votes 5 for, 2 against), from Mr. C. Turner, Slough. A bright-pink Pæony-flowered variety.

To Dahlia 'Tey Bell' (votes 6 for, 1 against), from Messrs. Dobbie, Edinburgh. A dark crimson-maroon Collerette variety with a white collar streaked with crimson.

To Dahlia 'The Guardian' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A very showy, large-flowered Garden Cactus Dahlia. The colour is bright red.

To Dahlia 'W. Dunn' (votes 4 for), from Messrs. Burrell, Cambridge. A scarlet Collerette variety with a yellow collar.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.

Messrs. Alex. Dickson, Newtownards: Dahlia 'Hawlmark Star' and Sunflower 'Cactus Star.'

Mr. J. A. Jarrett, Anerley: Dahlias.

Floral Committee, September 25, 1917.

Mr. H. B. May, V.M.H., in the Chair and twenty-seven members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for shrubs and Dahlias.
To Messrs. Alex. Dickson, Newtownards, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Piper, Langley, for shrubs.
To Mr. J. B. Riding, Chingford, for Dahlias.

Bronze Flora Medal.

To Mr. J. C. Allgrove, Slough, for *Rosa Moyesii*.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Mr. W. Wells, Jun., Merstham, for Asters and Delphiniums.

Award of Merit.

To Aster 'Joan Vaughan' (votes 15 for), from Messrs. Baker, Wolverhampton. An early flowering variety of the *Novi Belgii* section growing 6 ft. high.

The flowers are semi-double, 1¾ in. across, and of a lobelia-blue colour (shade 1, "Répertoire de Couleurs").

To *Ceratostigma Willmottiana* (votes 15 for), from Miss E. Willmott, V.M.H., F.L.S., Great Warley. A hardy shrubby species which has already attained the height of 6 ft. in the garden of the exhibitor. The flowers, which are a beautiful deep marine-blue colour, are borne in great profusion on the old wood in May and later in autumn on the young growths, so that the period of flowering may be said to last about six months.

To Dahlia 'Autocrat' (votes unanimous), from Mr. J. A. Jarrett, Anerley. A Collerette variety having a good stem. The florets are fiery-red tipped with yellow and the collar is bright yellow.

To Dahlia 'Blush Star' (votes 5 for, 1 against), from Messrs. Cheal, Crawley. A pale-pink Star Dahlia having a beautiful orange centre which contrasts pleasingly with the rest of the flower.

To Dahlia 'Cambria' (votes unanimous), from Messrs. Burrell, Cambridge. A very effective, large, rose-pink Decorative variety.

To Dahlia 'Fire King' (votes unanimous), from Mr. C. Turner, Slough. A fiery-red Collerette variety with a yellow collar. The flowers are borne on good stiff stems.

To Dahlia 'Mark' (votes unanimous), from Messrs. Burrell, Cambridge. A large bright fiery-red Pæony-flowered Dahlia.

To Dahlia 'Mrs. Ed. Moss' (votes 5 for, 2 against), from Messrs. Burrell, Cambridge. A very pretty pale-pink Pæony-flowered variety.

To Dahlia 'Mrs. J. A. Jarrett' (votes 6 for, 1 against), from Mr. J. A. Jarrett, Anerley. A crimson Collerette variety tipped with white and having a crimson and white collar.

To Dahlia 'Planet' (votes unanimous), from Messrs. Burrell, Cambridge. A crimson maroon Collerette Dahlia with very good stems. The collar is white tinged with crimson.

To Dahlia 'Sincerity' (votes 6 for, 1 against), from Messrs. Burrell, Cambridge. A bright-red Pæony-flowered variety with good stiff stems.

To Dahlia 'Snow Cloud' (votes 5 for), from Messrs. Stredwick, St. Leonards-on-Sea. A good white Collerette variety of nice shape with a very full collar of the same colour.

To 'Dahlia Transport' (votes 6 for, 2 against), from Messrs. Stredwick, St. Leonards-on-Sea. A white Decorative variety tipped with pale pink. The blooms are borne on good stems.

Other Exhibits.

Mr. E. Ballard, Colwall: Asters.
Mr. G. H. Quint, Princes Risboro': Dahlia 'Mrs. G. H. Quint.'

FLORAL COMMITTEE, OCTOBER 23, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for ferns.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for autumn foliage.
To Mr. E. J. Hicks, Twyford, for Roses.
To Mr. F. Lilley, Guernsey, for Nerines.
To Messrs. Piper, Langley, for berried shrubs.

Bronze Banksian Medal.

To the Alder River Nursery, Iver Heath, for Lilies and autumn foliage.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. G. Reuthe, Keston, for Nerines and hardy plants.

First-Class Certificate.

To *Berberis polyantha* (votes, unanimous), from the Gardens of the Royal Horticultural Society, Wisley.

Award of Merit.

To *Vitis betulifolia* (votes 13 for), from Mrs. Berkeley, of Spetchley, Worcester. A useful climber collected by Mr. E. H. Wilson, V.M.H., bearing bunches of large bluish-black fruits. The leaves, which are ovate and cordate at the base, assume a bronzy red tint in autumn.

Other Exhibit.

Mr. C. Turner, Slough: Aster 'Snow Bunting.'

FLORAL COMMITTEE, NOVEMBER 6, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver Banksian Medal.

To Messrs. May, Upper Edmonton, for ferns and Begonias.
To Messrs. Piper, Langley, for berried shrubs.
To Mr. G. Reuthe, Keston, for Nerines and hardy plants.

Bronze Flora Medal.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To Chrysanthemum 'Alec Hervey' (votes 15 for), from Mr. H. J. Jones, Lewisham. A very large deep golden-yellow Exhibition Japanese variety of good form.

To Chrysanthemum 'Crusader' (votes 7 for, 1 against), from Messrs. Lowe & Shawyer, Uxbridge. An excellent white Decorative variety.

To Chrysanthemum 'Donald' (votes 17 for, 2 against), from Messrs. Wells, Merstham. A very effective deep rose-pink Single variety with a golden-yellow eye.

To Chrysanthemum 'General Pétain' (votes 16 for), from Messrs. Wells, Merstham. A large pale-pink Japanese variety with long curled florets.

Other Exhibits.

Messrs. Chapman, Rye: Nerines.
Messrs. Cole, Peterborough: Chrysanthemum 'Mr. H. B. Witty.'

FLORAL COMMITTEE, NOVEMBER 20, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver Flora Medal.

To Misses Tanner and Tate (gr. Mr. Birkinshaw), Bushey Heath, for Begonias.

Silver Banksian Medal.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.
To Misses Price & Fyfe, Horsted Keynes, for Carnations.

Bronze Flora Medal.

To Messrs. Piper, Langley, for berried shrubs.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Adeline, Duchess of Bedford (gr. Mr. Dickson), Rickmansworth, for Primulas.

To Messrs. Low, Bush Hill Park, for Carnations.
To Mr. G. Reuthe, Keston, for hardy plants and Nerines.
To Messrs. Wells, Merstham, for Chrysanthemums.

Award of Merit.

To Chrysanthemum ' Brilliant ' (votes 8 for) from Mr. H. J. Jones, Lewisham. A medium-sized Decorative Japanese variety of a deep crimson colour with a golden reverse.

To Chrysanthemum ' Princess Mary ' (votes 21 for), from J. B. Fortescue, Esq. (gr. Mr. Page), Maidenhead. A very large clear yellow Japanese exhibition variety. It is a sport from ' Queen Mary,' which it resembles in all respects except colour.

To Primula ' Eureka ' (strain), (votes 12 for, 4 against), from Adeline, Duchess of Bedford (gr. Mr. Dickson), Rickmansworth. Primula ' Eureka,' which gives its name to this strain of remarkably large-flowered Primulas, has already received an Award of Merit. The other forms shown on this occasion have the large flowers, but differ in form and colour which varies from rose-pink to deep carmine. The following are the distinctive names given to some of the forms in this strain, ' Collerette,' ' Brilliant,' ' Sir Douglas Haig,' and ' Advance.'

Other Exhibits.

Mr. G. Carpenter, Byfleet : Chrysanthemums.
Messrs. Chapman, Rye : Nerines.
Miss Greaves, Reigate : *Lonicera quinquelocularis.*
C. Scrase-Dickins, Esq., Horsham : *Helleborus niger altifolius* and *Rubus polytritis.*
Messrs. Whitelegg, Chislehurst : Chrysanthemums.

Floral Committee, December 4, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver Banksian Medal.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To Perpetual-flowering Carnation ' Marion Wilson ' (votes unanimous), from Messrs. Allwood, Haywards Heath. This variety is a seedling raised by S. Wilson, Esq., of Epsom, in 1913, and introduced by the exhibitors. The flowers, which are large and well formed, have a yellow ground flaked with red.

To Perpetual-flowering Carnation ' Mrs. Edward Douty ' (votes 17 for), from Messrs. S. Low, Bush Hill Park. A variety raised and introduced by the exhibitors, having well-formed, bright crimson, slightly scented flowers of medium size.

Other Exhibits.

Messrs. H. Chapman, Rye : Nerines.
Mr. J. Jackson, Birkenhead : Chrysanthemum ' Evelyn Boldax.'
Messrs. Piper, Langley : berried shrubs.
Mr. H. W. Ratcliff, Stanstead : seedling Chrysanthemum.

ORCHID COMMITTEE.

JULY 3, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended :—

Silver Gilt Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid Miltonias, Odontiodas, and Odontoglossums.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for fine specimen Orchids.

Award of Merit.

To *Odontoglossum* × 'Queen Alexandra' var. 'Memoria Lionel Crawshay' (*Harryanum* × *triumphans* 'Lionel Crawshay') (votes unanimous), from de B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. Stables). The largest and best form of a favourite hybrid. Flowers with the general characters of *O. Harryanum* and with all the segments broadly ovate. Sepals and petals dark red-brown with a few yellow markings. Lip very broad, white in front, purple at the base.

Preliminary Commendation.

To *Odontioda* × 'Memoria Lionel Crawshay' (*Odm.* × 'Urania' × *Oda.* × *Charlesworthii*) (votes unanimous), from de B. Crawshay, Esq. The plant bore one large flower of fine substance, pale brownish-orange in colour.

Other Exhibits.

de B. Crawshay, Esq., *Odontoglossum* × 'Cleopatra' var. 'Memoria Lionel Crawshay.'

H. T. Pitt, Esq.: *Bulbophyllum Balfourianum.*

Messrs. Sander, St. Albans: species and hybrids.

ORCHID COMMITTEE, JULY 17, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Odontoglossums and Cattleyas.

To Messrs. Armstrong & Brown, Tunbridge Wells, for Odontiodas, Odontoglossums and Miltonias.

Preliminary Commendation.

To *Odontoglossum* × 'Lilian' ('Dora' × 'Empress of India') (votes unanimous), from Messrs. Charlesworth. Flower of the *O. crispum* type with the labellum expanded by the influence of *O. Pescatorei*, which is one of the parents of *O.* × 'Dora.' Flower broad in all its parts, white with violet spotting on the inner parts of the segments.

ORCHID COMMITTEE, JULY 31, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and ten members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Cattleyas and Laeliocattleyas.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Award of Merit.

To *Cattleya* × 'Rosita' ('Prince John' × *iridescens*) (votes unanimous), from Messrs. Armstrong & Brown. Flower large and of fine shape. Sepals and petals salmon-pink with a yellow shade. Lip magenta-crimson with bright yellow disc.

To *Cattleya* × 'Princess Royal' ('Fabia' × *Hardyana*) (votes 6 for, 3 against), from Messrs. Charlesworth. Flower resembling a dark *C. Hardyana*. Deep rose-purple with ruby-red lip having gold lines from the base.

Other Exhibits.

Baron Bruno Schröder: *Cattleya* × *illustris* var. 'Savoyard' ('Acis' × *iridescens*), a bright yellow flower with light purple front to the lip.

J. Ansaldo, Esq., Rosebank, Mumbles: *Sophrolaeliocattleya* × 'Corona,' Ansaldo's variety (*L.-c.* × 'Rubens' × *S.-l.-c.* × 'Dorila'). The flower closely approaches *Laelia pumila*, which is in each of the parents, both in colour and form.

ORCHID COMMITTEE, AUGUST 14, 1917.

Sir HARRY J. VEITCH, F.L.S., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid Cattleyas and Laeliocattleyas.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums and hybrid Cattleyas.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group.

Award of Merit.

To *Cattleya* × 'Albion' (*O'Brieniana alba* × 'Suzanne Hye de Crom') (votes unanimous), from Messrs. Armstrong & Brown. A compact flower of fine substance, pure white with chrome-yellow disc to the lip.

To *Cattleya* × *triumphans* var. 'The Baron' ('Rex' × *Dowiana aurea*) (votes unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flower intermediate between the two parents. Sepals and petals bright yellow, lip magenta-crimson with rose margin and gold lines from the base to the centre.

Other Exhibits.

Messrs. Flory & Black: *Brassocattleya* × 'Ilene.'

ORCHID COMMITTEE, AUGUST 28, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids.

To Messrs. Charlesworth, Haywards Heath, for Laeliocattleyas, Odontoglossums, &c.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for interesting species and hybrids.

First-class Certificate.

To *Brassocattleya* × 'Lady Veitch' (parentage unrecorded) (votes unanimous), from Messrs. Flory & Black, Slough. A large and finely formed silver-white flower with a slight blush tint and some indistinct purple lines on the petals. The disc of the fringed lip is light orange.

Award of Merit.

To *Laeliocattleya* × *canhaminosa* (*Canhamiana* × *luminosa*) (votes unanimous), from Messrs. Armstrong & Brown. Sepals and petals light yellow; the frilled lip rosy-mauve colour with golden disc.

To *Cattleya* × 'Mrs. Pitt,' Charlesworth's variety (*Harrisoniana* × *Dowiana aurea*) (votes 11 for), from Messrs. Charlesworth. The spike bore four magenta-crimson flowers. Front of the lip purplish-crimson, the disc golden-yellow.

To *Cattleya* × 'Naidia' *exquisita* (*iridescens* × *Hardyana*) (votes 7 for), from Messrs. Hassall, Southgate. Flowers fragrant, sepals and petals yellowish-salmon colour. Lip crimson with yellow disc.

Other Exhibits.

Baron Bruno Schröder: hybrid Cattleyas.
Messrs. Flory & Black: *Brassocattleya* × 'Ilene.'
Messrs. Hassall: hybrids of *Cattleya* × *iridescens.*

ORCHID COMMITTEE, SEPTEMBER 11, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

To Messrs. Armstrong & Brown, Tunbridge Wells, for Laeliocattleyas, Odontoglossums and Odontiodas.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for a group.

Award of Merit.

To *Laeliocattleya* × 'Commander-in-Chief' (*C.* × 'Iris' × *L.-c.* × 'Mrs. Evelyn Norrie') (votes unanimous), from Messrs. Armstrong & Brown. Sepals and petals well displayed, bright citron-yellow; lip claret-crimson with a network of golden-yellow lines extending from the base to the centre. Column fleshy, white.

To *Laeliocattleya* × 'Bronze King' ('Anaconda' × *luminosa*) (votes unanimous), from Messrs. Armstrong & Brown. Flowers large and with broad segments. Sepals and petals yellow slightly tinged with rose on the outer halves. Lip magenta-crimson with lighter margin, and bronzy-yellow disc.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Laeliocattleya* × 'Hélène' (*L.-c.* × *bletchleyensis* × *C.* × 'Adula').
Messrs. Hassall, Southgate: hybrid Cattleyas.
Messrs. Flory & Black, Slough: hybrids.

ORCHID COMMITTEE, SEPTEMBER 25, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid Cattleyas and Laeliocattleyas.

To Messrs. Charlesworth, Haywards Heath, for hybrids and rare species.

To Messrs. Hassall, Southgate, for Cattleyas and Brassocattleyas.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group.

Award of Merit.

To *Cattleya* × *Iris*, Orchidhurst var. (*bicolor* × *Dowiana aurea*) (votes 10 for), from Messrs. Armstrong & Brown. Sepals and petals bronzy yellow, lip rosy mauve with yellow marking in the centre.

To *Brassocattleya* × 'Ilene,' 'The Bride' (*B.-c.* × 'Mme. Chas. Maron' × *C. Dowiana aurea*) (votes 8 for, 1 against), from Messrs. Hassall, Southgate. A large flower light rose-pink in colour and with oblong yellow patches on the lip.

Other Exhibits.

Messrs. Flory & Black, Slough: *Laeliocattleya* × 'Soulange' (*L.-c.* × 'Lustre' × *C. Dowiana aurea*).

ORCHID COMMITTEE, OCTOBER 23, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Gilt Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for Cattleyas, Odontoglossums, &c.

To Messrs. Sander, St. Albans, for Cattleyas.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, for a group.

To Messrs. Hassall, Southgate, for hybrids.

To Messrs. McBean, Cooksbridge, for a group.

First-class Certificate.

To *Odontoglossum crispum* 'The Premier' (votes unanimous), from Messrs. Charlesworth. A grand pure white form, home-raised.

Award of Merit.

To *Sophrolaeliocattleya* × 'Roehampton' (parentage unrecorded) (votes unanimous), from Dr. Miguel Lacroze, Bryndir, Roehampton. A showy flower of deep claret-red colour and nearest to *S.-l.-c.* × *bletchleyflora.*

To *Laeliocattleya* × 'St. George,' Bryndir variety (*L.-c.* × 'St. Gothard' × *C.* × 'Fabia') (votes unanimous), from Dr. Miguel Lacroze. A large flower of fine shape, bright rosy mauve with purplish-crimson front to the lip.

To *Laeliocattleya* × 'Zeno' (*L.-c.* × 'St. Gothard' × *C.* × *Luegeae*) (votes unanimous), from Messrs. Charlesworth. Flower large, bright rose with ruby-crimson front to the lip which has a yellow centre.

Preliminary Commendation.

To *Odontoglossum* × 'Adonis' (*crispum Solum* × hybrid) (votes 11 for, 1 against), from Messrs. Armstrong & Brown. Flower nearest to *O. crispum Solum*, white with irregular claret blotches.

To *Odontoglossum* × 'Aspasia' ('Mars' × 'Colossus') (votes unanimous), from Messrs. Armstrong & Brown. A large flower heavily blotched with purple on blush-white ground.

To *Odontoglossum* × 'Nysa' (*eximium* × 'Alexandra') (votes 10 for), from Messrs. Charlesworth. Inner parts of the segments claret-purple, the tips and margin tinted rose colour.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Cattleya* × *Browniae* with sixteen flowers on a spike, and *Odontoglossum coronarium.*

Dr. Miguel Lacroze: two hybrid Cattleyas.

Messrs. Flory & Black, Slough: *Laeliocattleya* × 'Phyllis.'

ORCHID COMMITTEE, NOVEMBER 6, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums, Cattleyas and Laeliocattleyas.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for home-raised *Cattleya Dowiana aurea.*
To Messrs. Sanders, St. Albans, for Cattleyas and Laeliocattleyas.
To Messrs. C. F. Waters, Balcombe, for hybrids.

First-class Certificate.

To *Cattleya* × 'Astron,' The Dell variety (*Harrisoniana alba* × *Dusseldorfei* 'Undine') (votes 11 for, 4 against), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). The spike bore six pure white flowers with sulphur yellow disc to the lip. The original form was given an **A.M.**, Nov. 3, 1914.

Award of Merit.

To *Sophrolaeliocattleya* × 'Bryndir' (*S.-l.-c.* × 'Sandhage' × *L.-c.* × 'Golden Oriole') (votes unanimous), from Dr. Miguel Lacroze, Bryndir, Roehampton. Flower of good size and shape. Sepals and petals dark ruby-red. Lip claret-red with gold veining.
To *Brassocattleya* × *Dietrichiana,* Ansaldo's variety (*B.-c.* × 'Mrs. J. Leemann' × *C.* × 'Fabia') (votes 15 for), from J. Ansaldo, Esq., Rosebank, Mumbles. A large cream-white flower tinged with rosy lilac and with large chrome-yellow disc in the centre of the lip.
To *Miltonia* × 'Venus' var. 'Fascinator' (*vexillaria* × *Phalaenopsis*) (votes 15 for, 1 against), from Messrs. Charlesworth. Flower formed like *M. vexillaria,* light rose with dotted lines of crimson on the lip.

Other Exhibits.

Sir Jeremiah Colman, Bart.: hybrid Cattleyas and Odontoglossums.
Messrs. Stuart Low: hybrid Cattleyas.
Dr. Miguel Lacroze: *Cattleya* × 'Tityus' var. 'Bryndir.'
Baron Bruno Schröder: three Laeliocattleyas.

ORCHID COMMITTEE, NOVEMBER 20, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids.
To Messrs. Charlesworth, Haywards Heath, for a group of the orange-coloured *Epidendrum vitellinum autumnale* and white Odontoglossums.

Lindley Medal.

To Messrs. Armstrong & Brown, for the new Buttercup yellow *Brassolaeliocattleya* × 'Lady Manningham Buller.'

First-class Certificate.

To *Brassolaeliocattleya* × 'Lady Manningham Buller' (*B.-c.* × *Digbyano-Mossiae* var. 'Queen Alexandra' × *L.-c.* × 'Ophir') (votes unanimous). A noble flower of a uniform clear yellow colour. From Messrs. Armstrong & Brown.

Award of Merit.

To *Sophrolaeliocattleya* × 'Anzac' var. 'Vesuvius' (*S.-l.-c.* × 'Marathon' × *L.-c.* × *Dominiana*) (votes 6 for, 3 against), from Messrs. Charlesworth. Flowers rosy-mauve with a reddish tint and light claret front to the lip.

To *Odontoglossum* × 'General Allenby' (*crispum nigrescens* × hybrid) (votes 14 for), from Messrs. Flory & Black, Slough. A well-formed white flower with claret blotches on the inner parts of the segments.

Cultural Commendation.

To Mr. J. E. Shill, gr. to Baron Schröder, for *Cattleya* 'Astron' with a fine spike of ten white flowers.

Other Exhibits.

The Duke of Marlborough: two hybrid Cattleyas.
Sir Jeremiah Colman, Bart.: *Brassolaeliocattleya* × 'Antoinette.'
Messrs. McBean: a group.
Messrs. Flory & Black: hybrid Orchids.

Orchid Committee, December 4, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and seventeen members present.

Awards Recommended:—

Williams Gold Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for group of hybrids.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums and Laelio-cattleyas.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for hybrid Cypripediums.

Award of Merit.

To *Sophrocattleya* × 'Faboris' (*C.* × 'Fabia' × *S.-c.* × 'Doris') (votes 10 for), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flower large. Sepals and petals pale yellow, lip rose colour veined with reddish purple.

To *Cypripedium insigne* var. 'Louis Sander' (votes 12 for), from Messrs. Sanders, St. Albans. A large form similar to the Harefield Hall variety but with darker and larger spotting on the dorsal sepal.

Other Exhibits.

Dr. Miguel Lacroze: *Sophrolaeliocattleya* × 'Marathon,' Bryndir variety
Messrs. E. H. Davidson: Sophrocattleyas.
Messrs. Stuart Low: hybrids.

CERTIFICATES OF DILIGENT INTEREST IN PLANTS, 1917.

Edith Gillespie for the best kept plot in the Waterloo Wesleyan School garden.

May Mackay for the best collection of vegetables grown in the Waterloo Wesleyan School garden.

Fred Blake for work in the Hosey Boys' School garden, Westerham.

ESTABLISHED 1804.

INCORPORATED 1809.

TELEGRAMS: "HORTENSIA SOWEST LONDON."

TELEPHONE: VICTORIA 5363.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W. 1.

NOTICES TO FELLOWS.

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1. IMPORTANT NOTICES.

1. The Society's Hall in Vincent Square being still occupied by the Australian Imperial Force, the Fortnightly Meetings will continue to be held in the London Scottish Drill Hall, Buckingham Gate, Victoria Street. It is hoped that Fellows will do their utmost to support these Meetings during their temporary transference to the Drill Hall.

2. The Lectures will be given at the Drill Hall.

3. The Society's Offices and Library will continue in Vincent Square as heretofore. The Scientific Committee will also meet as before at Vincent Square.

2. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the incon-

venience of remembering their subscriptions, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments ; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society ; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W. 1."

3. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease ; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

4. NEW FELLOWS.

The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as, owing to the great increase in work which has fallen upon, or been voluntarily undertaken by, the Society, it is now more important than ever to fill the places of those who are taken from us. A letter on this subject was sent to all the Fellows in December last. Should any Fellow have failed to receive it, another copy will be sent on application to the Secretary, R.H.S., Vincent Square, London, S.W. 1.

5. AN APPEAL.

What has been accomplished for the Society is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by :—

1. Increasing the Number of Fellows.
2. Presenting Books for the Library at Vincent Square and at Wisley.
3. Sending new or rare Plants, Seeds, and Roots for the Garden and for distribution to Fellows, and for helping to keep the Hospital Camps in France and Flanders, &c., furnished.

6. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the 1914 Annual Meeting for the further development of the practical and scientific work at Wisley, the Council were fortunate in securing the services of Dr. Keeble, F.R.S., as Director. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of

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* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to complete this sum ?

the Society and the Imperial College. All communications to the Gardens should be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till 6 P.M., except on Sundays, Good Friday, Christmas Day, and Meeting Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; or motor cars can be had at Byfleet Station by applying to Mr. Finch, or Mr. Howard, Byfleet, Surrey. Accommodation and refreshments can be had at the Hut Hotel close to the Gardens, and also at the Hautboy, Ockham.

7. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

8. DISTRIBUTION OF SURPLUS PLANTS.

Some years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive those surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows who had paid the current year's subscriptions the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to return their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows who have paid the current year's subscription can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. Owing to the railways declining to deliver these parcels any longer, they *must* now be sent by post, the postage being prepaid by Fellows. Directions as to the amount of the remittance to be sent will be found on the application form for plants, which kindly consult before sending it in.

Parcels will be addressed exactly as given by each Fellow on the address label accompanying his application form.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

9. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words : "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations which are held in June are practical, *viva voce*, and written ; the practical part being held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W. 1.

10. EXAMINATIONS, 1919.

The revised syllabus of the different examinations can be obtained from the Society's Office, Vincent Square, S.W. 1, post free for 1½*d*.

11. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungus attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. 1.* Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

12. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz. : a fee of £3 3*s*. for one day (or £5 5*s*. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the *owner*.

13. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.

Numerous requests for help having recently reached the Secretary from the Allotment and Cottagers' Societies now springing up all over the Kingdom, the President and Council have responded by revising and extending the benefits offered to Affiliated Societies. It is hoped that all Societies will by Affiliation become united with the parent Society and through it with each other. Such a unity cannot fail to be attended with good and progressive results.

14. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1919 contains a considerable quantity of new information and is compiled more especially for the single-handed gardener. Fellows may obtain it from the R.H.S. Office, Vincent Square, London, S.W. 1 ; bound in imitation leather, 2*s*. over the counter, 2*s*. 3*d*. post free.

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* *See* R.H.S. Gardeners' Diary—"How to send Specimens for Identification."

15. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1s. 9*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W. 1.

16. R.H.S. FOOD PRODUCTION PUBLICATIONS FOR THE ASSISTANCE OF COTTAGE AND ALLOTMENT GARDEN SOCIETIES.

To assist the rapidly growing army of Allotment Holders and Cottage Gardeners the Society has had the following publications prepared :—

	Post free. *s. d.*
Rules and Regulations for Allotment Societies	2
Rules for Judging Cottage and Allotment Gardens	2
Companion Judges Sheet for ditto	3
Rules for Allotment and Vegetable Exhibitions	2
Vegetable Bottling and Fruit Preserving without Sugar, by Mr. and Mrs. Banks (including valuable recipes for Jams and Jellies)	1 8

Printed lectures, illustrated with lantern slides, have been prepared for the use of Societies of Allotment Holders. For particulars apply to the Secretary, R.H.S. Vincent Square, S.W. 1.

17. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. 1. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. The enormous increase in the cost of paper and printing has entailed a further revision of the price of these Pamphlets, which until further notice will be 6*d.* each, by post, 7*d.*

FOOD PAMPHLETS :—

(*e*) Vegetables and How to Grow Them.
(*f*) Vegetables from Seed sown in July and August.
(*q*) The Cultivation and Manuring of the Garden.
(*r*) Potatos in Gardens and Allotments.
(*w*) Potato Growing—Spring work.
(*x*) Potato Growing—Autumn work.
(*y*) Potato Growing, Some Experiments in.
(*v*) Cropping Allotments and Small Gardens.
(*a*) List of Hardy Fruits, with Cultivation.
(*c*) The Pruning of Fruit Trees.
(*b*) The Training of Fruit Trees.
(*d*) Keeping Fruit Trees Clean.
(*k*) Fruit and Vegetable Bottling and Storing.
(*m*) Vegetable Cookery.
(*n*) Salads and Salad Making.

OTHER GARDEN PAMPHLETS :—

(*g*) The Herbaceous Garden.
(*h*) The Rose Garden.
(*i*) Flowers for Small Gardens, Window Boxes, &c.
(*j*) Hardy and Half-Hardy Annuals in the Open Air
(*o*) War-time Economy in Gardening.
(*p*) Medicinal Plants and their Cultivation.
(*s*) Fruit Cultivation under Glass.
(*t*) The Pruning of Hardy Shrubs.
(*u*) The Children's Garden.

500,000 of these Pamphlets have been sent out since 1915.

18. LIST OF THE MOST DESIRABLE VARIETIES OF FRUIT.

DRAWN UP BY THE FRUIT COMMITTEE.

Orders for this list may now be given. Its price is 2*s*. post free. It contains nearly 200 pages, and besides the original list drawn up by the Committee, it gives lists of varieties recommended by nearly 100 expert growers and gardeners all over the country for their respective geographical divisions of Great Britain. The list shows the result of a ballot as to which varieties are to be preferred from such points of view as vigour of constitution, and for various types of growth and cultivation, as, *e.g.*, in the case of Apples—Bush, Standard, Espalier ; Pears—Bush, Standard, Espalier, Wall. It also shows the best varieties for cooking as distinct from dessert, the best for markets, and much similar detailed information which must prove of great help in these days when the planting of more fruits as well as of more vegetables is so widely recognized as being of urgent necessity.

19. FREE LEAFLETS.

The following leaflets may be had free on receipt of a ½*d*. stamped addressed envelope :

Fruit Bottling for Cottagers.
Lady Carbery's Recipe for Preserving Fruits.
R.H.S. Dutch Brown Beans.
The Cultivation of Beans for Winter Consumption.
A List of R.H.S. Gardening Charts for Societies and Schools.

20. BOOK ON FRUIT AND VEGETABLE BOTTLING.

Fellows of the Society have shown exceptional interest in the long series of lectures given during this year at the Fortnightly Meetings by Mr. and Mrs. Vincent Banks on Fruit and Vegetable Bottling, who have now, in response to many requests, prepared a book on the subject. The Council, recognizing the value of the information it contains, and the demand for instruction of this kind, have published it. It contains the most up-to-date information on the subject and is most practical. It deals not only with the Bottling of both Fruits and Vegetables, but also with the making of Jam, and the pulping of Fruit to be made into Jam later on, when sugar supplies are more abundant than they are just now. There are also many useful household recipes, and all the information given is the result of the actual experience of the authors extending over a long number of years. Mr. and Mrs. Banks' exhibits of Bottled Fruits at the Society's Meetings are well known to the Fellows for their excellence. The price of the 1918 revised edition, which may be obtained from the R.H.S., Vincent Square, London, S.W. 1, is 1*s*. 6*d*. over the counter, or post free 1*s*. 8*d*. ; bound in stiff paper covers.

21. R.H.S. WAR RELIEF FUND.

The work of the Society having greatly increased since the outbreak of the War and the staff having greatly diminished, the Council found that the management of this fund imposed far too great a demand upon the staff, a demand indeed which it was impossible to meet. A special Administrative Committee for the War Relief Fund was, therefore, appointed. The Committee is composed of Members of the Council, and of the Ladies' Executive Committee which has done such admirable work in collecting money for the fund. The Office of the Fund is at 17 Victoria Street, Westminster, S.W. 1, where all communications and donations should be addressed.

22. SHIRLEY POPPIES.

Owing to the great increase in the Society's work both in itself and on behalf of the Increase of Food Production of the Government, Mr. Wilks is unable to undertake the distribution of Poppy Seed this year. He has, therefore, given

all his 1918 crop of seed to the Society, and it will be found listed with the other seeds in the Annual Distribution which takes place in March and April.

23. GARDEN CHARTS.

In the spring of the year it was made known that our Society was engaged in preparing a series of garden charts. It was hoped that they would be completed and ready for use this winter. It is most disappointing that our hopes in this respect have not been realised; but we have had to meet untold difficulties, not the least amongst them being the fact that our colour printers' works have been commandeered by the Admiralty, which has the prior claim upon all their machines. So great has been the pressure upon the works during the past summer that we have been able to do little more than get some of our Charts "proved." By the time this notice appears, however, at least eighteen will be ready, and can be had from the Society's Office, Vincent Square, Westminster, price 3*s.* 6*d.* each.

INDEX.

The references in italics are to figures and illustrations.

* For individual plants, consult article.

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